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REPUBLIC OF THE SUDAN

REPORT



OF THE



MEDICAL SERVICES, MINISTRY OF HEALTH

FOR THE YEAR

1959/60



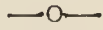
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## CHAPTER I

### INTRODUCTION

The country was subjected to some outbreaks of diseases during the year under review. The statistical tables within give the figures for these.

In Khartoum Province a sharp rise in the incidence of Poliomyelitis was encountered during the months of August and September, the fly breeding season. Cerebro-spinal Meningitis occurred in epidemic form during the season of May—July, also coinciding with the influx of pilgrims from Western Africa.

In the Blue Nile the incidence of Kala Azar in the southern part though decreasing has not completely disappeared. Smallpox made an appearance and in all probability it was a local focus. Yellow Fever also invaded the Southern Fung area bordering Ethiopia and it was proved that the infection came into the Sudan from that part. Detailed information is contained in the body of the report. Infective Hepatitis made its appearance in Sennar area for the third year running. The Province Medical Officer of Health, Blue Nile Province is of the opinion that special investigation of this problem is urgent.

Smallpox in Blue Nile and Eastern Sudan and Relapsing Fever in Darfur appeared in small numbers and were quickly controlled. Relapsing Fever was also a local focus.

In Bahr El Ghazal a survey to assess the problem of Onchocerciasis was carried out and as a result a programme of control was planned with World Health Organization assistance and work has already started in this.

In the Northern Province a Bilharzia Snail Survey was conducted and revealed heavy infestation of most parts especially in the agricultural schemes. Hospital figures and examination of school children indicate a high infection rate. A control programme, also with the assistance of W.H.O. is being worked out and it was agreed to start with a pilot scheme in one area gradually covering the whole field utilizing the experience and knowledge gained from the pilot project. Kala Azar Control work in Upper Nile Province continued and the Research Laboratory continued to investigate and study the epidemiology of this disease and is already functioning. This work is undertaken by NAMRU—3.

In Equatoria the fight against Sleeping Sickness continues. This is mainly through periodic inspection for case finding, treatment and prophylaxis with Lomidine.

#### **W.H.O. Assisted Projects**

*B.C.G. Campaign* operated in Bahr El Ghazal Province. 148,974 persons were tested and 51,733 vaccinated.

*T.B. Pilot Project* :—Wad Medani Tuberculosis Clinic is running on a properly organized system. It is going well according to plan in training, demonstration, case finding and treatment. 83 persons from different categories have been trained and 16,883 cases passed through the Clinic. 9,370 persons were tested of whom 3,768 were vaccinated during the year.

The prevalence survey in the Blue Nile Province has finished.

### *Malaria Pilot Project*

Work went according to plan. By the end of the year more than 400,000 of the population have been directly protected. Surveillance, which has been established in a zone around Sennar, comprising 75,000 population, has proved to be of great value for detection of residual foci and introduction of cases. A special campaign for the cotton pickers in the project area was carried out immediately after their dwellings were constructed. Nearly 5,000 seasonal labourers have been successfully protected by these operations. Supplies from W.H.O. as well as vehicles from UNICEF have been received.

*Nursing College* :—Seven girls graduated during this year as Nursing Sisters and the School is functioning well.

*Blood Banks* :—The Building of the Central Transfusion Laboratory in Khartoum Hospital has been completed. Most of the equipment provided by World Health Organisation was received and kept in the Ministry of Health Stores.

### *Venereal Diseases Campaign :*

An expert from W.H.O. visited the Sudan during the year. He reported that in six Provinces which he toured which were inhabited by about 5 million people, one million people were found infected with Venereal Diseases. It is the object to eradicate this serious scourge from a public health and social point of view.

Equipment and supplies from W.H.O. have been received and a plan is being worked out.

### **UNICEF Assistance**

UNICEF assistance was extended during the year in the way of skimmed milk, vitamin capsules, sewing machines, vehicles etc. to Mother and Child Health Centres, Training Institutes and W.H.O./UNICEF Assisted Projects.

### **Fellowships :**

The following candidates were awarded study courses during the year :—



NAME	Nature of Study	Country
Dr. Ali Nur ... Sayed Murtada Ahmed AbuGasim } (Ministry of Information and Labour).	Regional training course on Occupational Health ... ..	Alexandria
Dr. Mansour Ali Haseeb ...	Preparation of dried Smallpox vaccine ...	U.K.
Dr. Abdulla Hassan Kushkush...	D. P. H. ... ..	U.K.
Dr. Hassab El Rosoul Suleiman	Psychological Medicine ... ..	U.K.
Dr. Mohd. Zaki Mustafa ...	Industrial Health ... ..	Turkey
Dr. Hamdi Salih El Gabbani ...	D. P. H. ... ..	U.K.
Dr. El Sheikh Abdel Rahman ...	Therapeutic Radiology ... ..	U.K.
Sitt Aziza Gmer Saboun ...	Public Health Nursing ... ..	Beirut
Mariam Ahmed Abul Ela ...	Higher Nursing ... ..	Beirut
Boutheina Mohd. Adnan ...	" " ... ..	Beirut
Osman Eff. Suleiman ...	Vital Statistics ... ..	Beirut
Abdel Moneim Eff. Ahmed Ali...	" " ... ..	Beirut
Sayed Khalafalla Babiker ...	Malaria Eradication ... ..	Jamaica
Abdel Wahab Eff. Abdulla ...	" " ... ..	Cairo
Michail Eff. Lual Dud ...	" " ... ..	Cairo
Dr. Osman Awadalla ...	F.R.C.S. ... ..	U.K.
Dr. Naseer Mohd. Fadl El Mula	F.R.C.S. ... ..	U.K.
Dr. Abdel Hafiz Yousif ...	Ophthalmology ... ..	U.K.
Dr. Abdulla Saad... ..	Ear, Nose and Throat ... ..	U.K.
Dr. Muneer Mohd. Osman ...	Ophthalmology ... ..	U.K.
Dr. Mansour Ali Haseeb } Dr. Hadi El Nagar ... }	Production of Anti-Scorpion Serum ...	Cairo

Some 13 visitors from W.H.O. and various other countries visited the Sudan either in connection with the above-mentioned projects or on fellowship study tours.

Delegates from the Ministry of Health have attended the following conferences or seminars :—

NAME	Conference	Date
Dr. A. A. Zaki ... ..	W.H.O. Sub-Committee (A)—Alexandria...	14th — 19th Sept., 1959
Dr. Khalil Abdel Rahman ...	Regional Workshop on Planning and Administration Development—Addis-Ababa	14th — 25th Sept., 1959
Dr. Taha Ahmed Baasher ...	12th Annual Meeting of World Federation for Mental Health—Barcelona ... ..	30th Aug.— 4th Sept., 1959.
Dr. Ibrahim Suleiman ... ..	W.H.O. Medical Conference on Trachoma —Tunisia ... ..	15th — 24th Oct., 1959
Dr. Mohy El Din Mahdi ...	XVth Tuberculosis Conference—Istanbul...	11th Aug.— 8th Sept., 1959
Dr. Mowafi Abdel Fattah ...	W.H.O. Conference in Connection with Smallpox in Brazzaville ... ..	15th — 19th Nov., 1959
Dr. Abbas Hamad Nasr ...	W.H.O. Malaria Eradication Meeting — Addis Ababa ... ..	11th — 21st Nov., 1959
Dr. A. O. Abu Shamma ...	Executive Board of W.H.O.—Geneva ...	Jan., 1960
Dr. Mahmoud Mohd. Hassan ...	Regional Pediatric Conference—Cairo ...	6th — 11th March, 1960
Dr. Ali Nur ... ..	W.H.O. Assembly ... ..	} 3rd — 21st May, 1960
Dr. A. O. Abu Shamma... ..	„ „ ... ..	
Dr. Osman Ibrahim ... ..	} Royal Society of Promotion of Health in U.K. ... ..	} 24th—25th April, 1960
Dr. Abdulla Hassan Kushkush }		

## CHAPTER II

### ADMINISTRATION

#### (a) STAFF AND FUNCTIONS

Table I shows the establishment of classified staff. Some categories of professional and technical staff were still under establishment. The table includes officials serving on secondment with Local Government Authorities.

#### PERSONNEL

TABLE I

Statistics of Classified Staff Establishment covering the period 1.7.1959 to 30.6.1960 :—

CATEGORY	Establishment	
	Sudanese	Expatriates
HEADQUARTERS		
Director ... ..	1	—
Deputy Director ... ..	1	—
Asst. Director (Public Health) and Curator of the Graphic Museum ... ..	1	—
Asst. Director (Hospitals) ... ..	1	—
Chief, Tuberculosis Division ... ..	1	—
Deputy A. Director (Hospitals) ... ..	1	—
Chief Public Health Inspector ... ..	1	—
Senior Establishments Officer ... ..	1	—
Inspector of Administration ... ..	1	—
Establishments Officer ... ..	1	—
Principal, School of Hygiene ... ..	1	—
Principal Matron ... ..	1	—
Asst. Principal Matron ... ..	1	—
Head Staff Clerk ... ..	1	—
Secretary to Minister of Health ... ..	1	—
Staff Clerk ... ..	4	—
Senior Clerk ... ..	10	—
Clerk (including T.B.T. Centre) ... ..	22	—
Junior Clerk (including Minister of Health Office) ... ..	8	—
FINANCE BRANCH		
Controller of Accounts ... ..	1	—
Inspector of Accounts ... ..	1	—
Head Accountant ... ..	1	—
Accountant ... ..	4	—
Senior Book-keeper ... ..	4	—
Book-keeper ... ..	19	—
Junior Book-keeper ... ..	3	—
STORES SECTION		
Controller, Medical Stores ... ..	1	—
Asst. Controller, Medical Stores ... ..	1	—
Supt. of Stores ... ..	2	—
Stock verifier ... ..	1	—
Senior Store-keeper ... ..	3	—
Store-keeper ... ..	18	—
Store-keeper under Training (Northern Hospitals) ... ..	10	—
Junior Store-keeper ... ..	8	—
Telephone Operator ... ..	1	—
	137	—
HOSPITALS AND DISPENSARIES		
Senior Physician and Director, Khartoum Hospital ... ..	1	—
Senior Surgeon ... ..	1	—
Senior Obstetrician and Gynaecologist ... ..	1	—
Senior Ophthalmologist ... ..	1	—
Senior Psychiatrist ... ..	1	—
Physician (including Chest Physician—3) ... ..	10	1
Surgeons (including E. N. and T.) ... ..	3	8
Psychiatrist ... ..	1	—
Radiologist ... ..	3	—
Anaesthetist ... ..	—	2
Gynaecologist ... ..	6	1
Ophthalmologist ... ..	7	2
General Duty Doctor (including study courses) ... ..	136	22
House Officer (Housemen) ... ..	42	—



CATEGORY	Establishment	
	Sudanese	Expatriates
Senior Dental Surgeon ... ..	1	—
Dental Surgeon ... ..	2	3
Dental Officer ... ..	2	3
Dental Mechanic ... ..	2	—
Dental Mechanic Trainee ... ..	3	—
Pharmaceutical Registrar ... ..	1	—
Pharmacist ... ..	2	—
Lay Administrator ... ..	1	—
Supt. Radiography ... ..	1	—
Clinical Pathologist ... ..	1	—
Senior Dispenser ... ..	5	—
Dispenser ... ..	21	—
Dispenser Under Training ... ..	6	—
Senior Radiographer ... ..	2	—
Radiographer ... ..	20	—
Asst. Radiographer U.T. ... ..	18	—
X-Ray Technician ... ..	1	—
Hospital Manager ... ..	5	—
Dark Room Technician ... ..	1	—
Electrical Engineer ... ..	—	1
Laboratory Technician ... ..	—	3
Senior Medical Assistant ... ..	15	—
Medical Assistant ... ..	494	—
Mental Health Assistant ... ..	2	—
Ophthalmic Assistant ... ..	7	—
Refractionist ... ..	17	—
Senior Nursing Instructor ... ..	2	—
Nursing Instructor ... ..	33	—
Theatre Attendant ... ..	68	—
Head Mumarrid ... ..	52	—
Senior Clerk ... ..	8	—
Clerk ... ..	30	—
Junior Clerk ... ..	15	—
Card Clerk (New K.H.) ... ..	1	—
Senior Book-keeper ... ..	14	—
Book-keeper ... ..	23	—
Junior Book-keeper ... ..	37	—
Senior Store-keeper ... ..	2	—
Store-keeper ... ..	18	—
Asst. Store-keeper (Ex-Ration Clerk) ... ..	46	—
Store-keeper U.T. (Southern Hospitals) ... ..	7	—
Telephone Operator ... ..	6	—
Quarantine Overseer ... ..	2	—
Southern Trainee ... ..	10	—
NURSING STAFF		
Matron, Khartoum Hospital ... ..	—	1
Matron, Omdurman Hospital and N.T. School ... ..	—	1
Hospital Matron, (W/Medani, Port Sudan, Fasher, Juba, El Obeid and Atbara) ... ..	4	2
Asst. Matron (charge sisters) ... ..	7	8
Physiotherapist ... ..	—	2
Senior Nursing Sister ... ..	19	—
Nursing Sister (Expatriate) ... ..	—	23
School Hostess (Nursing C.) ... ..	1	—
A/Nursing Sister (Sudanese) ... ..	29	—
Dietician Sister (New Khartoum Hospital) ... ..	—	1
Theatre Sister (New Khartoum Hospital) ... ..	—	1
Sister Tutor (New Khartoum Hospital) ... ..	—	2
Ward Sister (New Khartoum Hospital) ... ..	—	17
Nurse U. T. Abroad ... ..	2	—
	1,279	104



CATEGORY	Establishment	
	Sudanese	Expatriates
<b>PUBLIC HEALTH</b>		
Province Medical Officer of Health ... ..	11	—
Asst. Province Medical Officer of Health ... ..	9	—
Woman Doctor ... ..	1	—
Senior Public Health Inspector ... ..	11	—
Public Health Inspector ... ..	12	—
Port Health Officer ... ..	1	—
Public Health Officer ... ..	58	—
Principal M.T. School ... ..	—	1
Principal H.V.T. School ... ..	1	—
Asst. P.H.V.T. School ... ..	1	—
Asst. P.M.T. School... ..	1	—
Health Visitor ... ..	19	—
Senior Staff Midwife ... ..	6	—
Staff Midwife ... ..	16	—
Asst. Supt. Nursing Officer ... ..	2	—
Senior Health visitor ... ..	6	—
Supt. M.T. School ... ..	6	—
Supt. Nursing Officer ... ..	8	4
Senior Sanitary Overseer ... ..	1	—
Sanitary Overseer ... ..	160	—
Public Health Student Under Training ... ..	23	—
Senior Technical Clerk ... ..	1	—
Clerk (including T.B. campaign) ... ..	6	—
Junior Clerk ... ..	12	—
Junior Book-keeper ... ..	1	—
	<b>373</b>	<b>5</b>
<b>RESEARCH AND LABORATORIES :</b>		
<b>(a) <i>Stack Medical Research :</i></b>		
Asst. Director Research ... ..	1	—
Bacteriologist ... ..	—	1
Pathologist ... ..	1	—
Registrar ... ..	1	—
Supt. Laboratory ... ..	1	—
Laboratory Technician ... ..	8	—
Laboratory Technician Trainee ... ..	8	—
Senior Laboratory Assistant ... ..	14	—
Laboratory Assistant ... ..	78	—
Head Laboratory Attendant ... ..	2	—
Junior Technical Assistant... ..	1	—
Senior Clerk ... ..	1	—
Clerk ... ..	1	—
Junior Clerk ... ..	1	—
<b>(b) <i>Chemical Laboratories (W.C.L.)</i></b>		
Government Analyst ... ..	1	—
Asst. Government Analyst ... ..	3	—
Scientific Officer Under Training ... ..	2	—
Senior Technical Assistant ... ..	2	—
Technical Assistant ... ..	5	—
Junior Technical Assistant... ..	3	—
Clerk ... ..	1	—
Library Clerk ... ..	1	—
<b>(c) <i>Medical Entomology :</i></b>		
Medical Entomologist ... ..	—	1
Asst. Scientific Officer Under Training ... ..	1	—
Entomological Technician ... ..	1	—
Technical Assistant ... ..	1	—

CATEGORY	Establishment	
	Sudanese	Expatriates
Junior Technical Assistant... ..	2	—
Junior Clerk ... ..	1	—
(d) <i>Schistosomiasis</i> :		
Biologist ... ..	—	1
Senior Technical Assistant ... ..	1	—
Technical Assistant ... ..	1	—
Clerk ... ..	1	—
Store-keeper ... ..	1	—
	146	3

SECTION	Establishment	
	Sudanese	Expatriates
GRAPHIC MUSEUM		
Asst. Curator... ..	1	—
Technical Assistant ... ..	1	—
Museum Attendants... ..	1	—
TOTAL ... ..	3	—

SUMMARY OF CLASSIFIED STAFF

SECTION	Establishment	
	Sudanese	Expatriates
Headquarters ... ..	137	—
Hospitals and Dispensaries ... ..	1279	104
Public Health ... ..	373	5
Stack Medical Research ... ..	118	1
Chemical Analytical Section ... ..	18	—
Medical Entomology ... ..	6	1
Schistosomiasis ... ..	4	1
Graphic Museum ... ..	3	—
GRAND TOTAL ... ..	1,938	112

Unclassified Staff excluding casual labour numbered 7,641 approximately.

## PHYSICIANS ETC. PRACTISING IN THE SUDAN

OCCUPATION	Government Officials Serving in M.H.	Private Practice
Physician (including Chest Physicians) ... ..	12	—
Surgeon ... ..	12	—
Obstetrician and Gynaecologist ... ..	8	—
Ophthalmologist ... ..	10	—
Psychiatrist ... ..	2	—
Radiologist ... ..	1	—
Anaesthetist ... ..	1	—
General Duty Doctor ... ..	200	90
Dentists ... ..	11	20
Pharmacist ... ..	3	45
Dispenser ... ..	27	—
Medical Assistant ... ..	509	—

### (b) LEGISLATION

The following legislations were enacted during the year :—

#### (1) THE EMPLOYMENT OF CHILDREN (WORKSHOPS)

##### (AMENDMENT) REGULATIONS, 1959)

(1959 L.R.O. No. 24)

In exercise of the powers conferred on it by Section 13 of the Employment of Children Ordinance, the Central Board of Public Health with the approval of the Minister of Health hereby makes the following amendment to the Employment of Children (Workshops) Regulations, namely :—

In Regulation (2) (ii) and after (g) the following is added :—

“ (h) Tobacco processing and cultivation ”

#### (2) PHARMACY AND POISONS (AMENDMENT) ACT, 1960

(1960 Act No. 7)

An Act to amend the Pharmacy and Poisons Ordinance.

In exercise of the powers conferred on him by Constitutional Order No. 1, the President of the Supreme Council for the Armed Forces hereby make the following Act :—

This Act may be cited as the Pharmacy and Poisons (Amendment) Act, 1960. It shall come into force on a date to be notified in the Gazette.

The Pharmacy and Poisons Ordinance is hereby amended as follows :—



(1) Section 40 is repealed, and the following substituted therefor :—

“ 40. No person shall sell any drug unless it conforms to standards laid down or endorsed by the Board ”

(2) In sub-section (1) of Section 42.

(a) After item (d) a new item is inserted as follows :—

“ (d) (a) Requiring pharmacists to supply to the Board all or any of the following particulars with regard to any poison, drug, pharmaceutical preparation or therapeutic substances proposed to be manufactured, imported, exported, transported, possessed, sold or labelled by them, namely

(i) Particulars of its composition, chemical formula and properties.

(ii) Particulars of the manner in which it is used or proposed to be used in medicine or public health, and its effect in that respect.

(iii) Particulars of any information in the possession of the pharmacist with regard to investigations or tests carried out to ascertain its effect when used in medicine or public health.”

(b) Item (f), is repealed, and the following substituted therefor :

“ (f) The import, export, transport, possession, sale and labelling of poisons, drugs, pharmaceuticals and therapeutic substances.”

### (c) FINANCE

TABLE II (A)

*Income and Expenditure of the Ministry of Health  
over the last 4 years*

	1956/57	1957/58	1958/59	1959/60
	LS.	LS.	LS.	LS.
<i>Revenue</i> ... ..	52,184	64,061	82,586	82,137
<i>Expenditure :—</i>				
Personnel ... ..	1,687,799	1,926,034	2,036,236	2,134,965
Services ... ..	1,404,318	1,753,318	1,785,949	1,849,213
Extraordinary ... ..	23,696	20,173	22,478	31,800
TOTAL ... ..	3,115,813	3,699,525	3,844,663	4,015,978

TABLE II (B)

*Analysis of Expenditure of Ministry of Health for 1959/60**Period 1.7.1959—30.6.1960*

SECTION	Personnel	Services	Extra-ordinary	Total
	LS.	LS.	LS.	LS.
Headquarters ... ..	103,427	552,395	31,800	687,622
Hospitals ... ..	1,691,855	1,106,225	—	2,798,080
Hygiene and Public Health... ..	259,854	182,178	—	442,032
Research ... ..	77,449	8,415	—	85,864
Graphic Museum ... ..	2,380	—	—	2,380
Seconded Staff ... ..	—	—	—	—
TOTAL ... ..	2,134,965	1,849,213	31,800	4,015,978

## REMARKS :—

1959/60 figures are based on actual expenditure up to 31.5.1960 plus estimated expenditure to end of June 1960.

### CHAPTER III

### PUBLIC HEALTH

**(a) HEALTH OF OFFICIALS**

TABLE III

NATIONALITY	Number of officials employed	TOTAL		Average days sickness	
		Number placed on sick list	No. of days sick	For all officials	For those who were sick
Sudanese ... ..	13,031	6,468	23,869	1.83	3.69
Non-Sudanese ... ..	531	95	453	.85	4.76

(b) GENERAL HEALTH

WORK DONE IN HOSPITALS AND DISPENSARIES

The following hospitals were opened for work during the year :—

	No. of Beds
El Thawra Hospital (Khartoum Chest Hospital) .. .. .	200
Renk Hospital .. .. .	60
Um Ruaba Hospital .. .. .	60
Tonj Hospital .. .. .	60
Bara Hospital .. .. .	40

The building of the following hospitals was completed during the year and will operate soon :—

	No. of Beds
Bentiu Hospital .. .. .	100
Daein Hospital .. .. .	60
Delgo Hospital .. .. .	60
Sinkat Hospital .. .. .	60

The following hospitals are still under construction :—

Borgeig Hospital

Abu Hamad Hospital

Zeidab Hospital

Buram Hospital

Hawata Hospital

Geteina Hospital

Each of these hospitals will accommodate 60 beds.



Other buildings that were approved for the year appear in the following list :—

PROVINCE	LOCALITY	BUILDINGS ERECTED
Bahr El Ghazal ...	Aweil	Out-patients Department Isolation Block.
Blue Nile ...	Gueisi	10 Bedded Ward for Dispensary.
Darfur ...	Fasher	Maternity and Gynaecological Block.
Kassala ...	Haya	New Dispensary and Houses.
Khartoum ...	Khartoum	Room for Lymph Vaccine Preparation at the Stack Laboratories.
	Omdurman	Alterations for Dental Asst. School
	Tuti	Health Centre.
	Gaili	House for Medical Assistant.
	Khartoum	Nursing College.
Equatoria ...	Khartoum	Extension to Nervous Diseases Clinic.
	North	
	Khartoum	Hostel for Nurses.
	Maridi	Out-patients Department.
	Maridi	Isolation Block.
Kordofan ...	Um Ruaba	Office and Quarters for Public H. Officer.
	Abu Gebeiha	Office and Quarters for Public H. Officer.
	Rigl El Fula	Office and Quarters for Public H. Officer.
	Babanousa	Houses for Med. Asst. and Mumarideen.
	Talodi	House for Med. Assistant.
Northern ...	Tangasi	Health Centre.
	Berber	Quarters for Public Health Officer.

The programme of expansion of Dispensary Services included the following additions.

PROVINCE								New Dispensaries	New Dressing Stations
Bahr El Ghazal	...	...	...	...	...	...	...	3	9
Blue Nile	...	...	...	...	...	...	...	7	27
Darfur	...	...	...	...	...	...	...	1	7
Equatoria	...	...	...	...	...	...	...	—	2
Kordofan	...	...	...	...	...	...	...	1	—
Northern	...	...	...	...	...	...	...	5	11
Upper Nile...	...	...	...	...	...	...	...	2	—
TOTAL								19	56

TABLE IV  
WORK DONE IN HOSPITALS AND DISPENSARIES  
FOR 10 YEARS

YEAR	Admissions	Attendances	Operations
1950/51 (18 months) ... ..	302,526	16,503,571	31,459
1951/52 ... ..	168,251	12,181,931	26,021
1952/53 ... ..	164,331	13,966,390	26,114
1953/54 ... ..	172,675	14,483,366	34,432
1954/55 ... ..	171,092	16,453,892	38,285
1955/56 ... ..	154,093	17,694,550	38,287
1956/57 ... ..	176,716	20,430,070	53,839
1957/58 ... ..	175,543	21,410,339	50,023
1958/59 ... ..	216,538	24,730,041	64,556
1959/60 ... ..	185,601	23,999,256	86,771

There were 90 licensed private practitioners working independently during the year under review. The figures of their work do not appear in the above list.

### ACTIVITIES OF SPECIAL DEPARTMENTS IN HOSPITALS

*Dental Clinics* :—Work done by these Departments in all provinces during the year is as follows :

No. of Attendances	..	..	..	..	..	..	81,072
Extractions	..	..	..	..	..	..	30,668
Conservations	..	..	..	..	..	..	4,335
Scaling and Gum Treatment	..	..	..	..	..	..	9,856
Minor Oral Surgical Cases	..	..	..	..	..	..	2,603

*X-Ray Department, Khartoum* :—The number of X-Ray Films taken for out-patients and in-patients during the year was 22,811.

*Physiotherapy Department, Khartoum* :—The number of attendances during the year was 35,165.

### (c) VITAL STATISTICS

Below is the estimated population of the Sudan rendered by the Department of Statistics as at mid 1960.

TABLE V  
*Approximate Estimation of Population by Province*

PROVINCE	Men	Women	Children	Total
Bahr El Ghazal ... ..	336,000	339,000	507,000	1,182,000
Blue Nile ... ..	637,000	642,000	1,082,000	2,361,000
Darfur ... ..	390,000	483,000	619,000	1,492,000
Equatoria ... ..	288,000	322,000	406,000	1,016,000
Kassala ... ..	377,000	296,000	435,000	1,108,000
Khartoum ... ..	180,000	151,000	247,000	578,000
Kordofan ... ..	563,000	602,000	847,000	2,012,000
Northern ... ..	225,000	288,000	469,000	982,000
Upper Nile ... ..	300,000	293,000	424,000	1,017,000
	3,296,000	3,416,000	5,036,000	11,748,000

TABLE VI

*Estimated Population of Towns of Khartoum,  
Khartoum North and Omdurman*

TOWN	Men	Women	Children	Total
Khartoum ... ..	42,176	26,725	38,519	107,420
Khartoum North and Rural Areas	96,871	86,765	158,343	341,979
Omdurman ... ..	40,753	38,366	49,482	128,601

TABLE VII

*Crude Birth Rate : Khartoum, Khartoum North and Omdurman*

TOWN	No. of Registered Births	Crude Birth Rate
Khartoum ... ..	4,326	40.3
Khartoum North and Rural Areas	6,323	18.5
Omdurman ... ..	5,011	39.0

These figures show the work done by licensed midwives only. It is a fact that many births are attended by unlicensed midwives and so no registration is made. It follows that the above figures are not complete.





(d) PREVENTIVE MEDICINE

1. Insect Borne Diseases

(i) **Malaria** : This disease is one of the major Public Health Problems. The yearly figures fluctuate according to rainfall. Adult mosquito control with Gammexane spraying is gradually being expanded in all Provinces. Larval control is being effected in big towns with gardens and Agricultural Schemes.

The following tables gives figures for cases and control activities.

MALARIA INCIDENCE 1959 60

YEAR	BAHR EL GHAZAL			BLUE NILE			DARFUR			EQUATORIA			KASSALA			KHARTOUM			KORDOFAN			NORTHERN			UPPER NILE		
	Cases	D	Mean Rain-fall mm	Cases	D	Mean Rain-fall mm	Cases	D	Mean Rain-fall mm	Cases	D	Mean Rain-fall mm	Cases	D	Mean Rain-fall mm	Cases	D	Mean Rain-fall mm	Cases	D	Mean Rain-fall mm	Cases	D	Mean Rain-fall mm	Cases	D	Mean Rain-fall mm
				*	*																						
1955 '56 ...	10,945	19	1,013	85,771	59	407	26,607	24	510	37,203	93	1,320	33,933	23	257	15,513	2	174	100,504	36	456	13,651	4	15	28,667	1	865
1956 '57 ...	15,890	78	1,167	116,925	48	538	59,134	5	716	47,737	137	1,546	57,510	29	304	19,296	3	264	140,698	55	683	16,115	9	70	26,645	29	979
1957 '58 ...	14,762	34	877	79,017	69	426	31,689	8	513	50,782	99	1,238	43,542	23	293	13,701	8	235	91,048	49	528	20,422	5	54	24,993	26	793
1958 '59 ...	17,025	44	1,016	96,404	45	432	47,990	19	576	86,458	145	1,409	56,914	28	219	21,078	8	167	144,485	51	416	15,923	3	28	30,136	10	741
1959 '60 ...	16,916	36	936	74,150	25	462	41,390	23	538	103,667	77	1,298	74,634	37	321	20,257	10	294	189,548	74	544	16,346	3	80	29,226	29	802

\*Figures include Gezira Irrigated Area.

Separate figures are reproduced hereunder for the Gezira Irrigated Area which shows effects of spraying where accessability of villages for periodical spraying is available :

SPRAYING ACTIVITY IN THE WHOLE COUNTRY

YEAR				No. of Cases Diagnosed as Malaria	Recorded Rainfall				
1955 '56	...	...	...	1,614	271.6 mm				
1956 '57	...	...	...	1,133	442.0 mm				
1957/58	...	...	...	1,054	271.9 mm				
1958 '59	...	...	...	2,899	439.6 mm				
1959/60	...	...	...	3,847	556.1 mm				
The number of rooms sprayed in Gezira Irrigated Area				...	...	...	...	618,310	
The number of rooms sprayed in Managil Area				...	...	...	...	84,287	
The number of villages sprayed including Managil Area				...	...	...	...	1,217	
The total amount of Gammexane or D.D.T. for spraying—LB				...	...	...	...	218,721	
The total population of Gezira Irrigated Area (including Managil)				...	...	...	...	645,280	

PROVINCE			Provisional Census	No. of Population Protected	No. of Rooms etc. Sprayed	Amount of Insecticides Used LB.
Bahr El Ghazal	...	...	1,182,000	29,547	9,556	20,167
Blue Nile	...	...	2,361,000	1,371,776	997,397	397,975
Darfur	...	...	1,492,000	148,749	120,158	48,951
Equatoria	...	...	1,016,000	30,072	24,318	14,005
Kassala	...	...	1,108,000	191,197	151,963	110,857
Khartoum	...	...	578,000	506,365	114,427	47,794
Kordofan	...	...	2,012,000	474,282	390,599	161,019
Northern	...	...	982,000	720,950	492,883	348,920
Upper Nile	...	...	1,017,000	93,342	46,836	9,536
TOTAL			11,748,000	3,566,280	2,348,137	1,159,224





TABLE VIII

*Species of Parasite in 6,335 Positive Slides*

PROVINCE	<i>P. Falciparum</i>	<i>P. Vivax</i>	<i>P. Malaria</i>
Bahr El Ghazal ... ..	264	9	5
Blue Nile ... ..	1,066	93	—
Darfur ... ..	421	98	—
Equatoria ... ..	1,471	—	—
Kassala ... ..	917	119	—
Khartoum ... ..	143	31	—
Kordofan ... ..	961	60	2
Northern ... ..	115	21	—
Upper Nile ... ..	430	25	84
TOTAL ... ..	5,788	456	91

(ii) **Blackwater Fever** : 2 cases were reported this year. Last year 2 cases were recorded.

(ii) **Relapsing Fever** : 6 cases were reported this year from Darfur Province. The infection was found to be a local one.

TABLE IX

*Relapsing Fever. Cases and Deaths over 10 Years*

YEAR	Cases	Deaths
1950/51 (18 months) ... ..	36	2
1951/52 ... ..	12	—
1952/53 ... ..	97	14
1953/54 ... ..	91	8
1954/55 ... ..	3	1
1955/56 ... ..	1	—
1956/57 ... ..	4	—
1957/58 ... ..	2	—
1958/59 ... ..	—	—
1959/60 ... ..	6	—

Delousing with D.D.T. Powder is in force for all immigrants from the west frontier posts.

(iv) **Leishmaniasis** : 4,017 cases were reported this year as compared with 8,414 cases last year. The majority of cases were reported from Blue Nile and Upper Nile Provinces.

The incidence, this year, has been noticeably reduced as a result of the successful campaigns which were carried out. It is hoped that the establishment of the centre for the United States Naval Medical Research Unit No. 3 (NAMRU-3), and the competent researchers working in it will bring to light many of the unknown facts about this disease in the near future.

TABLE X

*Leishmaniasis Recorded Incidence in 10 Years*

Year							No. of Cases
1950/51 (18 months)	..	..	..	..	..	..	638
1951/52	..	..	..	..	..	..	1,063
1952/53	..	..	..	..	..	..	613
1953/54	..	..	..	..	..	..	895
1954/55	..	..	..	..	..	..	1,106
1955/56	..	..	..	..	..	..	1,889
1956/57	..	..	..	..	..	..	7,463
1957/58	..	..	..	..	..	..	3,939
1958/59	..	..	..	..	..	..	8,414
1959/60	..	..	..	..	..	..	4,017

TABLE XI

*Leishmaniasis 1959/60 Distribution by Provinces*

PROVINCE							Cases	Deaths
Bahr El Ghazal	...	...	...	...	...	...	—	—
Blue Nile	...	...	...	...	...	...	1,590	61
Darfur	...	...	...	...	...	...	7	2
Equatoria	...	...	...	...	...	...	105	4
Kassala	...	...	...	...	...	...	317	27
Khartoum	...	...	...	...	...	...	36	4
Kordofan	...	...	...	...	...	...	50	2
Northern	...	...	...	...	...	...	4	1
Upper Nile	...	...	...	...	...	...	1,908	29
TOTAL	...	...	...	...	...	...	4,017	130

(v) **Trypanosomiasis** : New cases detected were 262 with 5 deaths. In 1958/1959 169 cases were recorded with 2 deaths.

This disease is still endemic in the western bank of Equatoria Province, particularly Yei, Maridi, Li Rangu and Sources Yubu districts. Prophylactic use of Lomidine as well as regular inspection of the population was continued during the year.

Table XII shows the distribution of cases for 10 years.

TABLE XII

*Trypanosomiases : Distribution of Cases in Equatoria  
in 10 Years*

Years	Yubu	Yambio	Yei	Kajo-Kaji	Meridi	Imported	Other Localities
1950/51	15	33	12	—	—	—	—
1951/52	—	93	3	—	2	26	—
1952/53	—	53	18	—	—	2	—
1953/54	12	148	44	—	—	—	—
1954/55	—	467	92	—	1	1	—
1955/56	2	210	98	—	—	—	—
1956/57	18	871	74	2	4	—	—
1957/58	34	37	88	—	—	—	—
1958/59	8	37	118	—	4	—	2
1959/60	24	—	223	—	—	—	15

(vi) *Filariasis* : 1,281 cases were microscopically diagnosed during the year.

1,273 cases of this total were reported from Equatoria, Bahr El Ghazal and Upper Nile Provinces of the Southern Sudan.

## 2. EPIDEMIC AND ENDEMIC DISEASES

(i) *Yellow Fever* : 120 cases with 88 deaths were reported this year.

Since 1941 no cases of this fever occurred except this year when 114 cases and 88 deaths occurred in Kurmuk Area in Blue Nile Province and 6 other cases at Guffa and Maaban in bordering areas of Upper Nile Province.



## EXTRACT FROM PROVINCE MEDICAL OFFICER OF HEALTH,

### BLUE NILE PROVINCE, ANNUAL REPORT

#### (i) “ *Yellow Fever Outbreak in Southern Fung* ”

In July, 1959 an outbreak of Influenza-like infection spread in Ballatona Village in Kurmuk District where many deaths occurred. Investigation revealed no clue and the setting in of rains interrupted further investigation until October, when another outbreak of a similar nature occurred in the area. This time it was wide-spread in all parts of the district and created panic among the population.

Most of the cases showed positive blood films for Malaria but were not amenable to treatment. Four cases died in hospital and many fatalities were reported from the District and across the Ethiopian boundary. In his cable to the Medical Officer, Kurmuk, the Province Medical Officer of Health directed his attention to the possibility of Yellow Fever and cabled the Headquarters at Khartoum to send a Bacteriologist.

The first case of Yellow Fever was diagnosed on October 25th. The disease continued with unabated vigour owing to the difficulty of obtaining vaccine from abroad.

114 cases with 88 deaths were reported

Vaccine was hurriedly sent by air and on 4.11.1959 Dr. Satti and Dr. Gutba El Din arrived by air followed by the Province Medical Officer of Health. His Assistant and Senior Public Health Inspector arrived on 8.11.1959 by surface route where they made an extensive survey of Roseires Area, Ingassana Hills and Kurmuk Sub-District.

In Tago of Ingassan Hills, 22 cases were recorded and three cases were seen by us before death with the typical symptoms and signs. In Kurmuk hospital five cases were seen two of which ended fatally on the second day of our arrival.

Measures of control were enforced by declaring the area as infected, followed by restrictive measures and of protection of the population by immunisation. As a precautionary measure, a barrier was created by vaccinating all people who might have possible contact with the infected area, especially the Nomads. Therefore our barrier extended from Guli, Dali Mazmum to Wad El Nayal, Abu Hugar down to Singa and curving to Guesi Abu Hasheem in Dinder Area and Karkoj Umdurman Fallata and Bonzoga on the Eastern bank of the river.

On 28.11.1959, contact was established between our side and representatives of Ethiopia, Dr. Berdonnean and Dr. Aseffa representing the latter. Information was received that thousands of the population had succumbed across the boundary. This information was confirmed by the admission of two cases from across the frontier into Kurmuk hospital. Both cases ended fatally.

About 100,000 of the population were immunised in the infected area and 30,113 along the barrier line. The last case of Yellow Fever reported was on 8.12.1959 at Kurmuk.

On 8.1.1960, Dr. Satti was accompanied by an American Team. Captain Anderson of the Navy, Mr. Gindo and Bimbashi Khandour paid a visit to Singa and then to Roseires to carry out mass vaccination. They found that 95 % of those exposed had already been vaccinated. 8,000 and 500 respectively were vaccinated in Singa and Roseires Districts. The difficulties encountered during the campaign were the dispersal of Nomads and bad roads which in some places were waterlogged and impassable for motor transport.

The army made an invaluable contribution by placing six cars at our disposal.

The last Yellow Fever outbreak in this country was in the Nuba Hills which lie in the western part of the Sudan. In 1940, 15,633 cases with 1,627 deaths were recorded.

Because of this fact it was considered necessary to carry out mass inoculation of the people of this area and 50,000 inoculations were done.

(ii) *Anthrax* :— 167 cases with 3 deaths were reported.

(iii) *Cerebro-spinal Meningitis* :—1,459 cases with 181 deaths were reported this year.

TABLE XIII  
**CEREBRO-SPINAL MENINGITIS**  
*Cerebro-spinal Meningitis*  
*Recorded Incidence and Fatality 1959/60*

PROVINCE							Cases	Deaths	Fatality Rate
Blue Nile	...	...	...	...	...	...	137	25	19.3
Darfur	...	...	...	...	...	...	6	1	16.7
Kassala	...	...	...	...	...	...	28	6	21.4
Khartoum	...	...	...	...	...	...	376	29	7.7
Kordofan	...	...	...	...	...	...	49	19	3.9
Northern	...	...	...	...	...	...	37	6	16.2
TOTAL NORTHERN PROVINCES							633	86	13.6
Bahr El Ghazal	...	...	...	...	...	...	147	24	16.3
Equatoria	...	...	...	...	...	...	562	66	11.7
Upper Nile	...	...	...	...	...	...	117	5	4.3
TOTAL SOUTHERN PROVINCES							826	95	11.5
OVERALL TOTAL							1,459	181	12.4



TABLE XIV

*Cerebro-spinal Meningitis : Recorded Incidence and Fatality over 10 Years*

YEAR							Recorded Cases	Recorded Deaths	Fatality Rate
1950/51 (18 months)	...	...	...	...	...	...	57,575	7,710	13.4
1951/52	...	...	...	...	...	...	14,527	2,031	14.0
1952/53	...	...	...	...	...	...	2,938	644	21.9
1953/54	...	...	...	...	...	...	8,942	827	9.2
1954/55	...	...	...	...	...	...	3,470	492	14.2
1955/56	...	...	...	...	...	...	9,028	828	9.2
1956/57	...	...	...	...	...	...	5,888	578	9.9
1957/58	...	...	...	...	...	...	2,008	178	8.8
1958/59	...	...	...	...	...	...	1,179	208	17.6
1959/60	...	...	...	...	...	...	1,459	181	12.4

TABLE XV

(iv) *Diphtheria : Recorded Incidence and Fatality During the Year*

PROVINCE							Recorded Cases	Recorded Deaths	Fatality Rate
Bahr El Ghazal	...	...	...	...	...	...	2	1	50.0
Blue Nile	...	...	...	...	...	...	117	18	15.4
Darfur	...	...	...	...	...	...	9	2	22.2
Equatoria	...	...	...	...	...	...	20	3	15.0
Kassala	...	...	...	...	...	...	137	18	13.1
Khartoum	...	...	...	...	...	...	488	21	4.3
Kordofan	...	...	...	...	...	...	88	18	20.5
Northern	...	...	...	...	...	...	57	8	14.0
Upper Nile	...	...	...	...	...	...	22	2	9.1
TOTAL	...	...	...	...	...	...	940	91	9.7

TABLE XVI

*Diphtheria : Recorded Incidence and Deaths in 10 Years*

YEAR							Cases	Deaths
1950/51 (18 months)	...	...	...	...	...	...	573	77
1951/52	...	...	...	...	...	...	280	30
1952/53	...	...	...	...	...	...	717	37
1953/54	...	...	...	...	...	...	335	27
1954/55	...	...	...	...	...	...	369	61
1955/56	...	...	...	...	...	...	356	38
1956/57	...	...	...	...	...	...	1,497	52
1957/58	...	...	...	...	...	...	506	38
1958/59	...	...	...	...	...	...	859	52
1959/60	...	...	...	...	...	...	940	91



- (v) *Dysentery* : 5,001 cases were treated in hospitals and 182,961 as out-patient cases.
- (vi) *Enteric Fever* : 763 cases with 35 deaths were reported during the year.

TABLE XVII

*Enteric Fever : Distribution 1959/1960*

PROVINCE						Cases	Deaths
Bahr El Ghazal ...	...	...	...	...	...	1	1
Blue Nile	...	...	...	...	...	239	17
Darfur ...	...	...	...	...	...	1	—
Equatoria	...	...	...	...	...	12	—
Kassala ...	...	...	...	...	...	58	7
Khartoum	...	...	...	...	...	251	5
Kordofan ...	...	...	...	...	...	20	3
Northern ...	...	...	...	...	...	171	2
Upper Nile	...	...	...	...	...	10	—
TOTAL						763	35

TABLE XVIII

*Enteric Fever : ncidence over 10 Years*

Year									Recorded Cases
1950 51 (18 months)	...	...	...	...	...	...	...	...	560
1951 52	...	...	...	...	...	...	...	...	578
1952 53	...	...	...	...	...	...	...	...	598
1953 54	...	...	...	...	...	...	...	...	560
1954 55	...	...	...	...	...	...	...	...	548
1955 56	...	...	...	...	...	...	...	...	449
1956 57	...	...	...	...	...	...	...	...	410
1957 58	...	...	...	...	...	...	...	...	361
1958 59	...	...	...	...	...	...	...	...	687
1959/60	...	...	...	...	...	...	...	...	763

- (vii) *Gastro-Enteritis of Children* : Records of hospitals and dispensaries registered 155,786 cases of which 5,565 required hospitalization, with 501 deaths ; fatality rate was of 9 per cent of the total admissions.
- (viii) *Leprosy* : The total number of inmates in the country was 2,597.
- During the year 1263 cases were diagnosed, of which 522 came from Equatoria Province endemic zone.
- (ix) *Poliomyelitis* : 328 cases were recorded this year. 312 received hospital treatment with 30 deaths.
- (x) *Rabies* : 21 human cases were recorded during the year.
- (xi) *Small Pox* : The total number of cases reported was 336 with 9 deaths. Last year's cases were 380 with 90 deaths.

Distribution of Small Pox cases by Provinces is as follows :—

Province	Cases
Blue Nile .. .. .	241
Darfur .. .. .	20
Equatoria .. .. .	1
Kassala .. .. .	65
Khartoum .. .. .	3
Kordofan .. .. .	2
Northern .. .. .	4
<b>TOTAL .. .. .</b>	<b>336</b>

*Incidence of Small Pox and Vaccinations  
performed in the Last Ten Years*

YEAR	Cases	Vaccinations Performed
1950/51 (18 months) ... .. .	110	136,728
1951/52 ... .. .	346	593,372
1952/53 ... .. .	3,670	1,008,581
1953/54 ... .. .	3,030	1,500,000
1954/55 ... .. .	4,200	1,203,673
1955/56 ... .. .	1,427	1,748,190
1956/57 ... .. .	25	648,501
1957/58 ... .. .	295	2,678,223
1958/59 ... .. .	380	2,440,084
1959/60 ... .. .	336	633,275

The number of Small Pox vaccinations done during the year was as follows :—

Blue Nile .. .. .	169,760
Equatoria .. .. .	134,018
Kassala .. .. .	263,794
Khartoum .. .. .	37,075
Kordofan .. .. .	13,944
Northern .. .. .	10,493
Upper Nile .. .. .	4,191
<b>TOTAL .. .. .</b>	<b>633,275</b>

(xii) *Influenza* : 146,123 cases were reported during the year with 75 deaths as compared with 70,937 cases and 32 deaths last year.

(xiii) *Tuberculosis* : During the year the B.C.G. Campaign operated in Bahr El Ghazal Province and covered Yirol, Gogrial and Aweil Districts as well as some areas in the Western, Lakes and Tonj Districts. In addition retesting was carried out on some school children to ascertain post-vaccination allergy level.

No. Tested  
148,974

No. Vaccinated  
51,733

By 31st. May, 1960 the campaign in Bahr El Ghazal came to its end thereby ending the campaign in the three Southern Provinces.

The achievements of the mass campaign in the Southern Provinces from its inception in December, 1956 to end of May, 1960 were as follows:—

Province	No.	
	Tested	Vaccinated
Upper Nile .. .. .	108,240	29,661
Bahr El Ghazal .. .. .	199,958	68,141
Equatoria .. .. .	313,764	121,399

TABLE XIX

*Tuberculosis. Admissions to Hospitals in 10 Years*

YEAR	Pulmonary	Non-Pulmonary	TOTAL
1950/51 (18 months) ... ..	1,611	883	2,494
1951/52 ... ..	1,325	747	2,072
1952/53 ... ..	1,679	671	2,350
1953/54 ... ..	2,075	798	2,873
1954/55 ... ..	2,868	915	3,783
1955/56 ... ..	2,697	823	3,520
1956/57 ... ..	3,175	1,005	4,180
1957/58 ... ..	3,749	1,061	4,810
1958/59 ... ..	3,864	1,135	4,999
1959/60 ... ..	4,263	1,297	5,560

TABLE XX

*Tuberculosis Hospital Admissions by Provinces*

PROVINCE	Pulmonary	Non-Pulmonary	Total
Bahr El Ghazal ... ..	301	47	348
Blue Nile ... ..	866	275	1,141
Darfur ... ..	204	73	277
Equatoria ... ..	275	64	339
Kassala ... ..	541	116	657
Khartoum ... ..	1,161	271	1,432
Kordofan ... ..	434	158	592
Northern ... ..	299	66	365
Upper Nile ... ..	182	227	409
TOTAL ... ..	4,263	1,297	5,560

TABLE XXI

*Tuberculosis : 1959/60 Distribution of all Cases Diagnosed*

PROVINCE	Pulmonary	Non-Pulmonary	TOTAL
Bahr El Ghazal ... ..	485	175	660
Blue Nile ... ..	1,042	914	1,956
Darfur ... ..	217	74	291
Equatoria ... ..	331	96	427
Kassala ... ..	1,004	1,425	2,429
Khartoum ... ..	1,614	562	2,176
Kordofan ... ..	477	348	825
Northern ... ..	654	290	944
Upper Nile ... ..	1,238	962	2,200
TOTAL ... ..	7,062	4,846	11,908



### 3. HELMENTHIC DISEASES

(i) *Ankylostomiasis*. 12,587 cases were recorded, of these 9,765 cases were reported from the Southern Provinces.

(ii) *Dracontiasis*. 4,028 cases were treated during the year, of these 2,738 cases were reported from the Southern Provinces.

(iii) *Bilharzia* : 47,345 cases were recorded during the year. The Snail Control in the Gezira Scheme continued on the same lines as before *i.e.* Mechanical trapping, chemical traps and regular inspections of canals in search of snails. At the same time curative teams are dealing with discovered cases. 9,285 *Bilharzia* snail vectors were detected and destroyed as compared with 5,600 the year before.

#### BILHARZIA IN GEZIRA IRRIGATED AREA

YEAR	HAEMATOBIMUM						MANSONI					
	CHILDREN			ADULTS			CHILDREN			ADULTS		
	No.	Inf.	%	No.	Inf.	%	No.	Inf.	%	No.	Inf.	%
1956/57	45,662	1,188	2.5	61,762	1,136	1.8	45,662	1,620	3.5	61,762	2,907	4.7
1957/58	36,133	1,057	2.9	56,961	961	1.7	36,133	1,859	5.1	56,961	3,873	6.8
1958/59	40,260	912	2.3	48,245	823	1.7	40,260	1,807	4.5	48,245	2,500	5.2
1959/60	61,314	1,306	2.1	84,678	1,459	1.7	61,314	2,892	4.7	84,678	4,209	5.0

Distribution of *Bilharzia* cases in the whole country was as follows :—

PROVINCE						Cases	Deaths
Bahr El Ghazal	...	...	...	...	...	965	4
Blue Nile	...	...	...	...	...	17,448	9
Darfur	...	...	...	...	...	3,412	—
Equatoria	...	...	...	...	...	4,065	8
Kassala	...	...	...	...	...	119	—
Khartoum	...	...	...	...	...	4,566	2
Kordofan	...	...	...	...	...	11,020	2
Northern	...	...	...	...	...	5,636	1
Upper Nile	...	...	...	...	...	114	—
TOTAL						47,345	26

## INCIDENCE FOR THE LAST 10 YEARS

YEAR							Cases
1950/51 (18 months)	..	..	..	..	..	..	58,809
1951/52	..	..	..	..	..	..	29,987
1952/53	..	..	..	..	..	..	29,286
1953/54	..	..	..	..	..	..	30,725
1954/55	..	..	..	..	..	..	37,570
1955/56	..	..	..	..	..	..	31,741
1956/57	..	..	..	..	..	..	43,863
1957/58	..	..	..	..	..	..	41,645
1958/59	..	..	..	..	..	..	45,094
1959/60	..	..	..	..	..	..	47,345

### (e) SANITARY CIRCUMSTANCES

*Water Supplies* : Improvement of Town and Rural water supply continues. Controlled water yards and protected Haffirs for rural and nomadic areas are expanding.

*Refuse Disposal* : This is being carried out mainly in towns by orthodox methods of daily collection, burning and dumping.

*Sewage Disposal* : The sewage works in Khartoum Town is gradually replacing the bucket system. It has not yet covered the whole town.

In other towns bucket system, aqua privy, septic tank and pit latrine are in use.

*Housing and Town Planning* : The usual measures to ensure good housing and to avoid overcrowding are being taken by the authorities concerned in town expansion and new layouts.

## CHAPTER IV SOCIAL HYGIENE

*Midwifery* : The following table shows the midwifery training schools, date of foundation of each school, total number of midwives trained and number under training in 1959/60.

TABLE XXII

SCHOOL						Date of Opening	Total Midwives Trained since Opening	No. of Midwives under Training during 1959/60
Omdurman	...	...	...	...	...	1920	920	36
El Obeid	...	...	...	...	...	1948	92	12
Juba	...	...	...	...	...	1950	36	8
Malakal	...	...	...	...	...	1952	36	8
Medani	...	...	...	...	...	1953	83	16
Atbara	...	...	...	...	...	1955	51	14
Kassala	...	...	...	...	...	1957	7	4
El Fasher	...	...	...	...	...	1958	4	4
TOTAL							1,229	102

TABLE XXIII

*Distribution of Licensed Midwives in the Sudan*

PROVINCE	District Midwives	Certificated Nurse Midwives	Staff Midwives	Sisters	Health Visitors	Uncerti- ficated Nurse Midwives	Total
Bahr El Ghazal ...	10	—	—	—	—	2	12
Blue Nile ...	183	13	3	4	8	10	221
Darfur ...	38	3	2	3	2	1	49
Equatoria ...	20	1	1	1	1	23	32
Kassala ...	19	2	1	2	1	—	25
Kassala N.A. ...	18	4	—	2	2	1	27
Khartoum ...	142	38	9	9	9	—	207
Kordofan ...	118	9	3	3	2	3	138
Northern ...	159	9	2	3	3	4	180
Upper Nile ...	35	1	1	1	1	—	39
TOTAL ...	742	80	22	28	29	44	930

*New Midwifery Certificates Issued During the Year*

PROVINCE	Certificated Nurse Midwives	Village Midwives	Total
Bahr El Ghazal ...	—	4	4
Blue Nile ...	2	16	18
Darfur ...	2	4	6
Equatoria ...	—	4	4
Kassala ...	—	3	3
Khartoum ...	5	12	17
Kordofan ...	6	12	18
Northern ...	3	14	17
Upper Nile ...	8	8	16
TOTAL ...	26	77	103

Refresher courses were given to midwives of the following Provinces :—

PROVINCE	MIDWIVES
Equatoria .. .. .	3
Blue Nile .. .. .	6
El Obeid .. .. .	5
Kassala .. .. .	2
TOTAL .. .. .	16



Cases attended to by student midwives were as follows :—

SCHOOL							Normal Delivery	Transferred to Hospitals	Total
Omdurman	...	...	...	...	...	...	1,674	130	1,804
El Obeid	...	...	...	...	...	...	260	8	268
Medani	...	...	...	...	...	...	405	15	420
Malakal	...	...	...	...	...	...	190	—	190
Kassala	...	...	...	...	...	...	92	5	97
Juba	...	...	...	...	...	...	324	9	333
Atbara	...	...	...	...	...	...	230	10	240
El Fasher	...	...	...	...	...	...	90	4	94
TOTAL							3,265	181	3,446

*Maternal and Child Health* : Improvement and expansion in this important service continued. 1 Health Centre was opened during the year and training of staff maintained.

*Unicef* : is assisting in this service by the provision of necessary equipment and books for training and supply of milk and vitamins for use in the Centres. 34 Centres were assisted in this manner, during the year.

List below shows localities where Health Centres were operating :—

HEALTH CENTRES

Khartoum	..	..	..	..	..	..	6
Omdurman	..	..	..	..	..	..	5
Khartoum North	..	..	..	..	..	..	4
Dueim	..	..	..	..	..	..	1
Kosti	..	..	..	..	..	..	1
Singa	..	..	..	..	..	..	1
Hassaheissa	..	..	..	..	..	..	1
Medani	..	..	..	..	..	..	2
Hosh	..	..	..	..	..	..	1
El Fasher	..	..	..	..	..	..	1
Geneina	..	..	..	..	..	..	1
Juba	..	..	..	..	..	..	1
Kassala	..	..	..	..	..	..	1
Port Sudan	..	..	..	..	..	..	4
El Obeid	..	..	..	..	..	..	1
Wad Elias	..	..	..	..	..	..	1
Atbara	..	..	..	..	..	..	1
Malakal	..	..	..	..	..	..	1
En Nahud	..	..	..	..	..	..	1
Shendi	..	..	..	..	..	..	1
Ed Damer	..	..	..	..	..	..	1

Ante-natal Clinics were operating in the following places where no health centres were established :—

Wau	Um Ruaba
Kwojok (Mission)	Kadugli
Sennar	Talodi
Rosseires	Abu Zabad
Bakht Er Ruda	Moglad
Nyala	Abri (Mission)
Lui	Heiban (Mission)
Mundri (Mission)	Dakhla
Amadi	Berber
Torit	Police Camp (Medani)
Khatmia	Merowe
Gharb El Gash	Wadi Halfa
Swagi	Debeira
Gedaref	Hillat Gallaba
Deim El Arab	Fangak
Tuti Island	Tonga
Tendelti	

*Activities of Health Centres and Ante-natal Clinics throughout the Sudan for the Year 1959/60.*

PROVINCE	No. of Clinics	Attendances at Ante-natal Clinics	No. of Home Visits	No. of Health Centres	Attendances at Child Health Centres	No. of Deliveries by Trained Midwives
Bahr El Ghazal ...	1	3,860	36	—	—	580
Blue Nile ...	10	65,848	3,795	7	50,187	4,639
Darfur ...	2	8,040	221	2	9,430	1,145
Equatoria ...	5	3,300	—	1	3,689	902
Kassala S.A. ...	6	8,308	496	4	4,333	974
Kassala N.A. ...	6	14,601	303	1	7,888	1,070
Khartoum ...	16	118,890	5,428	15	83,000	8,363
Kordofan ...	12	12,618	800	3	8,290	1,145
Northern ...	11	20,900	722	3	4,534	1,301
Upper Nile ...	1	5,364	310	1	8,489	869
TOTAL ...	70	261,729	12,111	37	179,840	20,988

## MEDICAL EXAMINATION OF SCHOOL CHILDREN

*School Medical Service* : The number of pupils medically examined was :—

Bahr El Ghazal	..	..	..	..	..	..	484
Blue Nile	..	..	..	..	..	..	33,010
Darfur ..	..	..	..	..	..	..	13,030
Equatoria	..	..	..	..	..	..	6,411
Kassala ..	..	..	..	..	..	..	12,325
Port Sudan	..	..	..	..	..	..	16,137
Khartoum	..	..	..	..	..	..	10,252
Kordofan	..	..	..	..	..	..	6,007
Northern	..	..	..	..	..	..	37,629
Upper Nile	..	..	..	..	..	..	2,476
TOTAL							137,761

### *Results of Examinations of School Children for Different Diseases*

PROVINCE	No. Exami- ned	Trach- oma	Bil- harzia	Enlarged Spleen	Pulm. T.B.	Ancylo- stomiasis	Dental Caries	All Other Diseases
Bahr El Ghazal	484	3	29	17	—	75	—	—
G.I.A. Area ...	15,134	2,109	1,056	487	—	105	105	135
Blue Nile ...	17,876	1,245	534	226	—	13	—	166
Darfur ...	13,030	1,335	696	915	—	19	—	921
Equatoria ...	6,411	163	334	1,115	—	783	—	27
Kassala S.A. ...	12,325	942	84	217	—	—	—	—
Kassala N.A. ...	16,137	566	—	78	2	—	—	—
Khartoum ...	10,252	656	—	30	—	—	—	—
Kordofan ...	6,007	523	705	697	—	9	—	—
Northern ...	37,629	9,845	2,103	406	—	112	3,738	—
Upper Nile ...	2,476	418	10	429	—	2	—	—
TOTAL ...	137,761	17,805	5,551	4,617	2	1,118	3,843	1,249
Percentage ...		12.9	4.0	3.4	—	.8	2.8	.9

### *Mental Health*

The total number of cases seen during the year by the Psychiatrist at the Clinic for Nervous Disorders amounted to 12,462 of which 2,284 were new cases and the balance of 10,178 represented the return attendances.

The number of inmates in confinement at Kober Institution is 156 (147 males and 9 females).



The Mental Diseases Board saw 31 cases during the year. The findings of the Board were classified as follows:—

- 17 cases fit for temporary service or referred for treatment and to re-appear before the board at certain dates.
- 8 cases unfit for Government service.
- 6 cases fit for Government service.

Health Education

The weekly radio talks, press articles and exhibition of posters during tribal gatherings and Agricultural shows remained to be the media for Health Education.

The budding audio visual aid unit in Khartoum continued its activities and attempts at producing local films on health problems were made.

CHAPTER V  
PORT HEALTH QUARANTINE

No seaport or airport was declared infected during the year.

Disinfection of aircraft and quarantine control of air travellers were undertaken at Wadi Halfa, Port Sudan, Khartoum, Juba, Malakal, Geneina, El Fasher, El Obeid.

The Aedic Index was calculated on an inspection of all habitations within the area concerned. The following table shows the aedic index throughout the year at certain airports on international routes:—

TABLE XXIV  
*Aedes Aegypti* Index 1959/60

MONTH	Fasher	Juba	Kassala	Port Sudan	Khar-toum	El Obeid	Wadi Halfa	Malakal
July ...	0	0.2	0	0	0	0.005	0	0
August ...	0	0.09	0	0	0	0	0	0
September ...	0	0.1	0	0	0	0	0	0.1
October ...	0	0	0	0	0	0	0	0
November ...	0	0	0	0	0	0	0	0
December ...	0	0	0	0	0	0	0	0
January ...	0	0	0	0	0	0	0	0
February ...	0	0	0	0	0	0	0	0
March ...	0	0	0	0	0	0	0	0
April ...	0	0	0	0	0	0	0	0
May ...	0	0	0	0	0	0	0	0
June ...	0	0	0	0	0	0	0	0

*Port Sudan Quarantine*

The total number of ships inspected was 1,263 of which 239 were given Radio Pratique.

*Suakin Quarantine :—*

The number of pilgrims who left Suakin for Jeddah in 10 years was as follows :—

YEAR	No. of Pilgrims
1950/51 .. .. .	4,666
1951/52 .. .. .	6,491
1952/53 .. .. .	13,051
1953/54 .. .. .	13,950
1954/55 .. .. .	13,921
1955/56 .. .. .	11,427
1956/57 .. .. .	23,811
1957/58 .. .. .	29,618
1958/59 .. .. .	17,356
1959/60 .. .. .	16,824

The total number of pilgrims who left by air from Port Sudan during the season was 2,518.

All outgoing pilgrims were immunised against Cholera, Small Pox, Yellow Fever and Typhoid.

The pilgrimage this year, though the biggest ever recorded in Saudi Arabia, was declared free from epidemic diseases.

*Medical Mission to the Hedjaz :*

The Mission consisted of two doctors, three medical assistants and 14 other staff.

Treatment Centres were established at Jeddah, Mecca, Muna and Medina. Medical care was afforded to many nationalities, including pilgrims and local population. 19,933 reported for treatment and 96 were admitted to hospital.

*Wadi Halfa Quarantine :*

Examination of labourers coming from Egypt was carried out as usual. 365 river vessels were inspected during the year. 12,816 vaccinations against Small Pox were done in this quarantine.

*Geneina Quarantine :*

24,037 persons passed through this quarantine. 16,912 vaccinations against Small Pox were done.



### *Khartoum North Pilgrims Transit Camp :*

8,007 pilgrims passed through the camp during the period 14.3.1960 to 31.5.1960 and received the necessary inoculations against Cholera, Yellow Fever and Typhoid and were vaccinated or re-vaccinated against Small Pox before their departure.

All pilgrims returning to Khartoum were put under surveillance.

## CHAPTER VI

### MEDICAL TRAINING

#### *School of Hygiene :*

During the year 15 students were under training. 12 Sudanese and 3 from Aden. They sat for the Royal Society of Health Examination in April, 1960. Ten passed the examination and the other five have been referred for a period of three months on expiration of which they must pass the examination to be held in July, 1960.

#### *Medical Assistants Training School :*

41 students were under training. These were divided into two batches. In December, 1959, 27 students sat for the final examination ; 26 passed and one failed. In April, 1960 the other batch of 14 students sat their final examination ; 13 passed and one failed.

A new batch of 32 students was accepted in the school in April, 1960.

#### *Nurses Training School*

533 Nurses sat for the Final Nursing Examination. The number of successful candidates was 371.

#### *Laboratory Technicians and Assistants :*

4 Laboratory Technicians were under training. 16 Laboratory Assistants were trained and employed to fill vacancies in the newly built hospitals or to augment the establishment of big hospitals. Furthermore, 8 laboratory assistants have been trained for the Sudan Medical Corps to fill vacancies in newly built Military Hospitals. For the first time two female candidates were taken for training ; both candidates proved satisfactory, passed the Final Examination and have been employed by the Sudan Medical Corps.



EXISTING HOSPITALS, DISPENSARIES  
AND DRESSING STATIONS AND BEDS AVAILABLE

TABLE XXV

PROVINCE	Hospitals (57)	Beds in Hospitals			Dispen- saries	Beds in Dispen- saries	Total Beds	Dressing Stations	Popula- tion	Beds per 1,000 Population
		General	T.B.	Children						
Bahr El Ghazal	Wau	191	40	8	9	14	661	45	1,182,000	0.56
	Rumbek	119	—	—						
	Aweil	40	—	—						
	Raga	40	—	—						
	Tonj	40	—	—						
		430	40	8	9					
Blue Nile	Medani	326	120	73	54	64	1,798	95	2,361,000	0.76
	Rufaa	100	—	—						
	Kosti	148	—	—						
	Duein	98	16	—						
	Abu Usher	180	40	—						
	Sennar	156	—	8						
	Singa	141	—	—						
	Roseires	74	—	—						
	Kurmuk	84	—	—						
		1,307	176	81	141					
Darfur ...	Fasher	178	8	10	50	45	927	42	1,492,000	0.62
	Nyala	88	—	4						
	Geneina	96	—	4						
	Zalingei	75	—	—						
		437	8	18	58					

PROVINCE	Hospitals (57)	Beds in Hospitals				Dispen- saries	Beds in Dispen- saries	Total Beds	Dressing Stations	Popula- tion	Beds per 1,000 Population
		General	T.B.	Children	Maternity						
Equatoria	Juba	247	71	58	22	70	477	1,620	65	1,016,000	1.60
	Lui ...	45	8	3	4						
	Maridi	101	19	—	9						
	Li Rangu	118	12	2	4						
	Source Yubu	115	—	—	6						
	Yei ...	65	14	—	4						
	Torit	123	10	—	1						
	Kapoeta	66	—	16	—						
		880	134	79	50						
Kassala	Kassala	256	40	30	16	48	190	1,228	53	1,108,000	1.11
	Gedaref	179	20	12	3						
	Aroma	100	—	6	—						
	Port Sudan	209	68	23	14						
	Toker	62	—	—	—						
		806	128	71	33						
		553	—	119	46						
		—	392	8	—						
Khartoum	Thowra and	307	—	48	—	32	45	1,826	19	578,000	3.16
	Abu Anga	103	—	15	—						
	Omdurman...	86	—	14	10						
	Eye Hospital	40	—	—	—						
	Khartoum N.	—	—	—	—						
	Abu Deleig	—	—	—	—						
	Maternity	—	—	—	40						
	Hosp. Omd.	—	—	—	—						
		1,089	392	204	96						

PROVINCE	Hospitals (57)	Beds in Hospitals			Dispen- saries	Beds in Dispen- saries	Total Beds	Dressing Stations	Popula- tion	Beds per 1,000 Population
		General	T.B.	Children						
Kordofan	El Obeid ...	245	48	22	45 3 8 8 — 2 — — —	59	1,596	56	2,012,000	0.79
	Kadugli ...	117	8	—						
	Abu Gibeiha	80	—	12						
	Dilling ...	78	—	—						
	Talodi ...	60	—	—						
	Nahud ...	109	—	9						
	Rigl El Fula	38	—	8						
	Bara ...	34	—	—						
	Um Ruaba...	58	—	—						
		819	56	51						
Northern	Atbara	217	36	16	19 14 8 9 9 4	78	937	93	982,000	0.95
	Halfa	120	46	22						
	Dongola	65	12	1						
	Merowe	59	7	8						
	Berber	81	—	10						
	Shendi	60	—	8						
		602	101	65						
Upper Nile	Malakal	231	28	36	18 — —	38	796	21	1,017,000	0.78
	Bor ...	100	—	—						
	Renk	60	8	—						
		391	36	36						
GRAND TOTAL		6,761	1,071	613	534	448	11,389	489	11,748,000	0.97

The Ratio for Hospital Beds only is 0.76 per 1,000 Population.



## CHAPTER VIII

### LABORATORY SERVICES

#### (a) STACK MEDICAL RESEARCH LABORATORIES

*By*

DR. M. A. HASEEB

This report covers the period from July 1st 1959 to June 30th 1960. During this period *ad hoc* research was carried on Kala Azar, Yellow Fever, Poliomyelitis, blood sensitivity of organisms to anti-biotics and neoplasms. Summaries of these and other subjects will be found under the appropriate headings.

As usual a great part of the time of the staff was devoted to the teaching of laboratory technician trainees recruited from the Secondary schools.

Among visitors to the laboratories were Dr. Seal and other members of the staff of the United States Naval Research Unit No. 3 at Cairo to discuss the possibilities of co-operation in research on Kala Azar. They have already started doing work at Malakal.

International Co-operation Administration (I.C.A.) was very helpful in lending us the services of Dr. E. A. Anderson who brought with him five hypospray jet-injectors to assist in the campaign against yellow fever.

The writer spent two months in the United Kingdom studying the technique of preparing dried small-pox vaccine. Six weeks were spent at the Lister Institute at Elstree with Dr. McClean and two weeks at Edward High Vacuum Co., Horley. The study was most useful as a prelude to mass production of dried small-pox vaccine for this country.

#### EDUCATION AND ROUTINE ACTIVITIES

Sixteen laboratory assistants were trained and employed by the Ministry of Health to fill vacancies in the newly built Hospitals or to augment the establishment of big hospitals. Furthermore eight laboratory assistants have been trained for the Sudan Medical Corps to fill vacancies in newly built Military hospitals. For the first time two female candidates were taken; both candidates proved satisfactory, passed the final examination and have been employed by the Sudan Medical Corps.

Ten laboratory assistants were given refresher courses of two to three month's duration on advanced laboratory technique including the Kahn test.

Six female students from the Nursing College, Khartoum were given practical classes in bacteriology, haematology and other laboratory tests.

#### TECHNICIANS CLASS

Of the four technician trainees who were left in the class this year, two completed their training and passed the final examination. The remaining two were augmented by one new recruit and the three of them continued to receive training throughout the year.

The two laboratory technicians studying in the American University of Beirut completed their studies, obtained the Diploma in Public Health Laboratory Technique and resumed work at the Stack Laboratories.

## **ROUTINE WORK**

A summary of the routine work and research carried out during the period under review is appended to the report. The total number of the examinations was 43,228 as compared with 37,324 in the previous year and 34,981 in 1957/1958.

Histological work of rather a highly specialised type continued to increase: endometrial, testicular biopsies and smears from the cervix for evidence of malignancy. The testing of organisms for sensitivity to anti-biotics became a routine demand with hospitals and the work increased tremendously. Staphylococci are becoming more and more resistant to penicillin.

## **FORENSIC MEDICINE**

The establishment of a separate department for forensic medicine is becoming essential. Proposals to this effect are made in the submitted development plans. The requests for examination cover a wide range including blood stains, seminal stains, food poisoning, opium, identification of herbs, etc.

The issue of lymph vaccine was 1,882,900 doses this year compared with 2,875,000 doses last year. Dry vaccine is being prepared on a small scale. Initial laboratory experiments are promising and dried vaccine that could stand a temperature of 37°C for two months was produced.

## **PATHOLOGICAL SPECIMENS**

The total was 1,314 excluding brains for rabies, the total of the previous year was 1,030.

## **NEOPLASMS**

385 neoplasms were received of which 179 were malignant. The following table is a summary.



TABLE No. 1

System	Carcinoma		Sarcoma		Melanoma		Total Malign- ant Tumours	Benign	Total Benign
	Pr.	Sec.	Pr.	Sec.	Pr.	Sec.			
Genito-urinary System	63		2		1		66		118
External Genitals ...	1						1	8	
Uterus and Cervix	24						24	54	
Testicles ...	1						1	1	
Prostate ...	6						6	9	
Bladder ...	3						3		
Kidney ...	1						1		
Breast ...	17		1				19	16	
Ovary ...	10		1				11	30	
Gastro-intestinal	17		2		1		20		20
Lip and Mouth ...	3				1		4	11	
Tongue ...							—	1	
Pharynx and Oesophagus ...	2						2		
Stomach ...	4						4		
Gall Bladder ...	1						1		
Lower Gastro-Intestinal Tract and Anus ...	7		2				9	8	
							—		
Glands & Endocrines	11	9	14			1	35		
Thyroid ...	7						7	5	
Salivary ...	4						4		
Lymph Node and Lymphatics ...		9	14			1	24		
Head and Neck ...	10		2		1		13		18
Eye and Orbit ...	10				1		11	16	
Face ...			1				1	1	
Scalp ...			1				1	1	
Musculo-skeletal ...	3		11		7		21		28
Upper Limb... Trunk ...			2		1		3	14	
Lower Limb... ...	3		9		6		18	3	
								11	
Skin and Appendages	2	1					3		2
Peripheral Nerves	2	1					3	2	
Unclassified ...	21	—					21	15	15
TOTAL ...	127	10	31		10	1	179		206



Dr. Mirghani Yousif, the Pathologist reports as follows :—

“ During the year there was marked increase in the number of histopathological specimens. Gynaecological material, as mentioned last year, in form of uterine curettings, cervical biopsies and exfoliative cytology is also increasing in number.

In January, 1960, punched card system was introduced in this department. Classification by Province, type of hospital, anatomical location of biopsies and various categories of disease index is now available. The reports, now typewritten, show all these classifications and duplicate cards are filed in the department. Storage space for slides, tissue blocks and specimens is now adequate and a suitable filing system is also available.

In addition to the histopathological work, forensic serology (blood and seminal stains) is dealt with in this department. 286 seminal stains and 30 blood stains were examined and reported on.

March, 1960 witnessed the publication of “ Biopsy Review ”, which is a brief periodical review of the histopathological work done in this department. Apart from the statistical value of such a paper, we aim to stimulate the interest of doctors in the province hospitals to contribute to Scientific Studies and Research.”

**RABIES**

365 brains were received of which 21 were decomposed and useless for examination ; of the remainder 81 were positive for Negri bodies. This contrasts with 60 positive out of 333 brains received.

Few cases of human rabies were reported. A tragic case was reported in Khartoum North where a young man was bitten on the face by a rabid dog. Prophylactic treatment with anti rabic vaccine which was started immediately did not protect the patient who developed rabies 27 days after the bite. In this case the incubation period was so short that the vaccine had no chance of protecting him. Such cases may benefit from hyperimmune serum and therefore a small amount of serum has been obtained and stocked for future use.

The species and distribution of the positives and negatives in the past year is shown in the following table :—

TABLE NO. 2

ANIMALS						Positive	Negative	Decomposed	Total
Dog	...	...	...	...	...	51	189	17	257
Camel	...	...	...	...	...	—	2	—	2
Donkey	...	...	...	...	...	6	13	—	19
Horse	...	...	...	...	...	2	3	—	5
Cat	...	...	...	...	...	4	26	1	31
Cow	...	...	...	...	...	3	3	1	7
Hyena	...	...	...	...	...	—	1	—	1
Monkey	...	...	...	...	...	—	9	1	10
Goat	...	...	...	...	...	14	9	1	24
Unknown	...	...	...	...	...	1	7	—	8
Leopard	...	...	...	...	...	—	1	—	1
TOTAL						81	263	21	365



## **RABIES VACCINE**

There is a marked increase in the demand for anti-rabic vaccine. 987,000 doses were issued this year compared with 775,000 in the previous year. The amount issued this year is sufficient to treat 13,170 cases. The animals used for the preparation of the vaccine are goats and the technique is that recommended by the W.H.O. at Muguga, Nairobi, 1955. It is felt that a great deal of vaccine is being wasted as the treatment is decentralised.

## **LYMPH VACCINE**

180 sheep were used this year for the production of 10,170 grams of pulp with an average of 56.5 grams per sheep. The bulk of the vaccine used for vaccination is of the glycerinated type. Small batches of dried small-pox vaccine are being prepared for use in out-of-the-way districts.

## **YELLOW FEVER**

News was received late in October, 1959 that there were suspected cases of yellow fever around Kurmuk in the Southern Fung District and Doro and Guffa in the Upper Nile Province. On October 31st arrangements were made for a special plane to take Dr. Sati to Kurmuk for investigating the suspected cases. Yellow fever vaccine was also sent in the same plane to inoculate the suspected population in and around Kurmuk town and Doro village. Two viscerotome specimens of livers were collected as follows :—

1. Specimen No. 953, Nyie, aged 25 years, female patient had a short history of about three days with influenza-like signs and symptoms, black vomit, headache, backache, epigastric pain and mild jaundice. This case was found at Doro (Mahan) 25 miles south west of Kurmuk on the Yabus River. Patient died.
2. Specimen No. 954, Khadiga Ahmed aged 48 years, female patient also had influenza-like signs and symptoms, black vomit and died after two days from onset of disease. Patient was from Kurmuk town.

These two specimens were collected in 10 per cent. formal-saline and brought back to the Stack Laboratories for sectioning. The two specimens were sectioned and examined. The sections were highly suggestive of yellow fever. Confirmatory opinions on them were sought from Dr. F. O. McCallum of the Virus Reference Laboratory, Colindale and from Professor Hewer, Professor of Pathology, Singapore. Their views were as follows :—  
Dr. F. O. MacCallum reported as follows : 18.11.1959 :—

“ I looked at these sections on their arrival in the morning and registered my own opinion. In the evening there was a pathological society meeting and Dr. D. A. Cannon-formerly of the Yellow Fever Laboratory in Lagos, and Dr. Janet Niven, the pathologist of the National Institute for Medical Research were here, so I took the opportunity of showing these slides to them.

We all looked at them without reference to the numbers in the letter which I had from Professor Hewer and our unanimous opinion was, in fact, the same as his—that section 953 was very suggestive of the appearance of a liver of a patient with yellow fever, and that section 954 probably was the same. Having come to this conclusion I then showed Drs. Cannon and Niven some positive and negative yellow fever sections from Trinidad in 1954. We did, however, feel that if that fat stain had been carried out on fresh preparation one might have obtained even more convincing evidence. I do, of course, realise that under the conditions in which the material is collected this will rarely be possible ”.



Professor T. F. Hewer reported as follows : 16.11.1959 :—

“ I examined your two very nice sections of liver with great interest. Your number 953 shows very extensive necrosis of liver cells throughout the lobule but perhaps rather more noticeable in the middle and peripheral zones. There are a few surviving liver cells scattered throughout all zones. There are some mitoses suggesting that regeneration has begun. A noticeable feature of many of the dead cells is that their cytoplasm has undergone an intensely acidophil coagulative necrosis. In some there are round acidophil bodies in the cytoplasm which might well be called Councilman bodies. I feel that in view of the diffuse necrosis with so much acidophil change the diagnosis of yellow fever is extremely probable.

Your section 954 from Khadiga Ahmed shows much more extensive necrosis and therefore has fewer features that one can recognise. Here again the necrosis seems to be very acidophil and taken in conjunction with the liver of Nyie I feel that this is also probably yellow fever ”.

Professor Robert Kirk reported as follows : 9.12.1959 :—

“ No. 953 from the liver of Nyie aged 25 years from Doro (Maban) 7 miles southwest from Kurmuk on the Yabus river, I would regard as positive for yellow fever, without very much doubt.

No. 954 from the liver of Khadiga Ahmed aged 48 years from Kurmuk as suspicious, but I would not be prepared to say anything more than this, except perhaps to say “ suggestive ” instead of “ suspicious ”. I would like, however, to make a positive diagnosis of yellow fever on this liver.

The two sections have now been sent to the Rockefeller Institute, New York for further confirmation.

## THE EPIDEMIOLOGY OF THE DISEASE

The outbreak of the disease started at Dagabella village, which lies in the Southern Fung about 150 miles South of Kurmuk. The mumarid in charge of the dressing station in Dagabella suffered from influenza-like disease and died early in Sept., 1959. Cases were then reported from Chali, Wadaka, Doro (Maban), Miak, Wad El Mahi, Abu Shanina and villages south and south west of Kurmuk, town. Cases were also reported from the Ingassana hills.

The disease was characterised by sudden onset, influenza-like signs and symptoms particularly headache, infected eyes, backache, epigastric pain and vomiting. In some cases the vomit was of black colour. Many of the urines examined were found loaded with heavy albumen. Scanty urine, in some cases almost amounting to urine suppression, was a noticeable sign. The duration of the illness was short amounting on the average to about a week. Although it is not possible at the present time to assess the mortality rate accurately, it is probably on the high side.

The disease attacked mainly adults of both sexes : children seemed to be less affected. The total number of cases reported until 8.12.1959 was 114 with 87 deaths. The situation is now satisfactory and no more cases were reported since then.



The infected area so far can be defined as follows :—

All Southern Fung district and Doro (Maban) and Guffa areas in the north east corner of Upper Nile Province. This area lies from 12° North to 9° N latitude and from 33°E longitude to the Ethiopian Border.

Although cases occurred only in certain foci within this district yet for safety purposes a large area including a barrier has been declared infected where movements were controlled and inoculations against yellow fever were made compulsory. It is also to be noted that although no overt cases of yellow fever have previously been reported from this area, protection tests were found to be positive in previous surveys (Findley, Kirk and MacCallum, 1941).

## **INVESTIGATION AND CONTROL MEASURES**

Blood was collected from two cases at Doro (Maban) during the third day of the disease and two batches of six mice each were injected intracerebrally with 0.03 ml. each. Three of one batch of mice that were injected by the serum of one of the two patients developed rough coats and later paralysis of the hind legs. Their brains were taken out and kept in glycerine in the refrigerator. The brains have now been sent to Dr. Haddlow of the Virus Institute, Entebbe for identification.

An entomological survey was started by Mr. Qutubuddin, the Medical Entomologist, for the collection and identification of the mosquito vectors.

## **CONTROL MEASURES**

- (a) Spraying with insecticides : intensive spraying with D.D.T. was carried out in the infected area starting with Kurmuk town and working steadily to the neighbouring areas.
- (b) A mass campaign with yellow fever vaccine was started immediately on suspicion early in November. So far about 120,000 people have been inoculated. Inoculation centres have also been started in Malakal, Singa and Sennar so as to make a barrier round the infection area.
- (c) Control of movements to and from the infected area is under control. All travellers should be in possession of valid yellow fever certificates.

## **MASS INOCULATION WITH YELLOW FEVER VACCINE BY MEANS OF THE HYPOSPRAY JET INJECTORS**

Of these machines five were lent to us by the I.C.A. A mass inoculation campaign was started by Dr. M. H. Sati and the help of Dr. E. A. Anderson in the Eastern Fung District and Northern part of Upper Nile Province. The Nuba mountain area was also inoculated. Altogether about 178,000 persons were immunised within a short time. The jet injector can do six hundred persons per hour. Although inoculation is by high pressure only and no needle is used in this method, yet it gave very satisfactory results and full immunisation. To test its efficiency sera were collected from 20 school children in Khartoum before inoculation, the children were then inoculated by Dr. Anderson with the jet injector. They were vaccinated amongst 400 children and Dr. Anderson was not aware of the experiment. The children were then bled three weeks after vaccination and the sera before and after vaccination were collected and sent to Dr. Williams of the E. A. Virus Research Institute at Entebbe for favour of testing for the presence of yellow fever antibodies. Dr. Williams reported as follows :—



“ The immunisation programme in 20 selected children is a success. The results are clear out, all the pre inoculation sera are negative and all the part inoculation sera are positive.”

SEARCH FOR YELLOW FEVER VIRUS IN VERTEBRATES OTHER THAN MAN IN THE SUDAN.

Since the discovery of Findley and his co-workers of the presence of yellow fever immune bodies in the blood of African animals in 1936, sera from wild animals in the Sudan continued to be collected and examined for immune bodies by the mouse protection test.

The results of these early tests have been collected and published by Kirk and Haseeb in the Annals of Tropical Medicine and paras. page 225 (1953) Vol 47. A summary of the result is shown below in the following two tables :—

Showing results of testing the sera of Wild Animals from different parts of the Anglo-Egyptian Sudan for the presence of Immune Bodies to Yellow Fever

SPECIES					Locality	No. Positive	No. Negative
Cercopithecus aethiops (grivet monkey)	...	...	...	...	Fung	2	17
Erythrocebus patas (red hussar monkey)	...	...	...	...	Fung	0	2
Colobus Polykomos (colobus monkey)	...	...	...	...	Kau	0	1
					Imatong Mountains	0	2
Galago senegalensis (bush baby)	...	...	...	...	Nuba-Mountains	0	10
Coleura Gallarum (Themasis bat)	...	...	...	...	Kau	0	3
Epomorphus labiatus (Temminck's bat)	...	...	...	...	Kau	0	5
Liponycheris nudiventris (bat)	...	...	...	...	Kau	0	4
Atelerrix pruneri (Pruner's hedgehog)	...	...	...	...	Heiban	0	5
Procavia sp. undet (hyrax)	...	...	...	...	Nuba Mountains	1	3
Euxerus erythropus (ground squirrel)	...	...	...	...	Kau	0	2
Thamnomys dolichurus (long-tailed tree rat)	...	...	...	...	Kau	0	2
Silvicapra grimmi obyssinicus (duiker)	...	...	...	...	Kau	0	1
Mungus mango (banded mongoose)	...	...	...	...	Kau	0	1
Varanus niloticus (menitor lizard)	...	...	...	...	Kau	0	1

TABLE II

Showing the results of testing the Sera of Domestic Animals from different parts of the Anglo-Egyptian Sudan for the presence of immune bodies to Yellow Fever

ANIMALS						Locality	No. Positive	No. Negative
Cows	...	...	...	...	...	Various	3	27
"	...	...	...	...	...	Kau	4	12
"	...	...	...	...	...	Western Kordofan	2	2
"	...	...	...	...	...	Khartoum	0	5
"	...	...	...	...	...	White Nile	0	4
Sheep	...	...	...	...	...	Kau	0	4
"	...	...	...	...	...	Western Kordofan	2	13
Goats	...	...	...	...	...	Kau	0	3
Pigs	...	...	...	...	...	Kau	3	8
Dogs	...	...	...	...	...	Kau	2	3
Hens	...	...	...	...	...	Kau	0	6

In 1954 Taylor, Haseeb and Kirk carried out an extensive survey for yellow fever in Kordofan, Nuba Mountains, Bahr El Ghazal and Equatoria regions. Sera were collected from primates and tested for the presence of immune bodies by neutralisation tests. The results of this survey were published in the Bulletin of the World Health Organisation (1955) volume 12, page 711. A summary of the results of testing of the primates sera is tabulated below :—

TABLE III

*Results of Yellow Fever Neutralization Tests on Primate Sera of the Sudan*

MAP REFERENCE				Species	Total Tested	Positive No.	% *	Incon- clusive *
4	Dilling	...	...	Galago	16	0	0	0
5	Kadugli	...	...	Galago	12	0	0	2
				Red Hussar	1	0	0	—
6	El Muglad	...	...	Red Hussar	1	0	0	—
				Griwet	17	11	69	1
	...	...	...	Galago	10	0	0	1
11	Gogrial Area	...	...	Baboon	20	16	94	3
				Griwet	15	12	86	1
				Galago	18	1	6	1
				TOTAL	110	40	40	9

\* In calculating percentage of positives, inconclusives are not included.

It will be noted that only one of 56 galagos gave what was considered as a positive reaction ; this animal was shot in the Gogrial area. Four gave an inconclusive reaction with a small doze of virus. The remainder were negative, although in both the El Muglad and Gogrial area a high percentage of the griwet monkeys or baboons were positive. The over-all percentage of positives among the griwet monkeys is 77 (69 per cent in the El Muglad area and 86 per cent in the Gogrial area) ; 94 per cent of the baboons (all from the Gogrial area) were positive. The two red hussar monkeys, both quite young specimens, approximately six months of age, were negative.

Sera from primate and domestic animals are being collected now from the Fung Area and the Northern District of Upper Nile Province. The sera will be tested for the presence of yellow fever immune bodies.

### BLOOD

To be able to interpret the result of blood biochemistry correctly, one should be familiar with the normal constituents of blood in the community. As the constituents may vary in various communities and countries, it is felt that a short survey of the blood constituents in this country is essential. For this reason the following survey was carried out :—

One hundred healthy young men from the army and the police were taken at random and blood specimens collected from them. The specimens were tested for sugar, urea and cholesterol. The specimens of blood were collected first thing in the morning while the men were fasting and the sugar, urea and cholesterol estimations carried out according to E. J. King (1956). The results of the tests were as tabulated below :—



No.	Age	Locality	Sugar in mgm %	Urea in mgm %	Plasma Cholesterol in mgm %
1	22	El Mahas ... ..	70	33	Not done
2	26	G. Aulia ... ..	60	36	" "
3	20	Khandag ... ..	60	32	" "
4	21	Merowe ... ..	65	32	" "
5	22	" ... ..	90	40	" "
6	22	Abu Deleig ... ..	69	38	222
7	23	Merowe ... ..	96	32	222
8	25	Shendi ... ..	85	32	155
9	20	Dongola ... ..	96	36	133
10	20	Merowe ... ..	80	34	155
11	23	Atbara ... ..	60	32	175
12	24	Debba ... ..	60	30	225
13	24	Dongola ... ..	60	32	200
14	22	Halfayat El Muluk ... ..	50	35	200
15	27	Shendi ... ..	58	30	175
16	20	Omdurman ... ..	65	32	200
17	21	El Gaili ... ..	70	30	200
18	31	El Gaili ... ..	60	36	222
19	25	Khartoum ... ..	80	33	250
20	21	South ... ..	75	35	200
21	20	Dongola ... ..	66	27	166
22	24	Nuri ... ..	80	30	200
23	23	Gebel Gari ... ..	66	28	233
24	21	Omdurman ... ..	73	32	166
25	24	Wad-Banaga ... ..	66	30	233
26	26	El Obeid ... ..	65	20	285
27	24	Kaboshiya ... ..	80	23	200
28	26	Hassaheisa ... ..	65	26	200
29	24	Shendi ... ..	60	21	271
30	22	Dongola ... ..	70	26	228
31	23	El Obeid ... ..	60	27	160
32	35	Abri ... ..	60	20	160
33	35	G. Aulia ... ..	60	32	200
34	23	Khartoum North ... ..	70	30	170
35	23	Aweil ... ..	57	27	160
36	29	Dongola ... ..	56	28	230
37	22	Omdurman ... ..	56	30	200
38	27	Dongola ... ..	64	32	200
39	22	Kadogli ... ..	56	31	210
40	22	Khartoum ... ..	64	33	250
41	25	Shendi ... ..	70	23	230
42	21	Rumbek ... ..	60	25	190
43	25	Geili ... ..	55	20	200
44	22	Rumbek ... ..	60	30	190
45	20	Bor ... ..	65	25	190
46	23	Omdurman ... ..	55	20	170
47	20	Atbara ... ..	55	22.5	180
48	21	El Fasher ... ..	57	20	170
49	20	Muglad ... ..	63	20	170
50	20	Shendi ... ..	55	21	200
51	21	Shendi ... ..	57	23	190
52	22	El Fasher ... ..	75	25	200
53	26	Shendi ... ..	70	28	190
54	22	Shendi ... ..	58	28	230
55	25	Dongola ... ..	65	30	200
56	22	Dongola ... ..	68	27	175
57	24	Dongola ... ..	55	26	180
58	30	Daein ... ..	58	18	190
59	29	Dar Mali ... ..	60	22	160
60	20	Khartoum ... ..	57	26	210

No.	Age	Locality	Suger in mgm %	Urea in mgm %	Plasma Cholesterol in mgm %
61	24	Dongola ... ..	62	24	175
62	26	Dongola ... ..	65	27	145
63	21	Dongola ... ..	56	22	200
64	25	Merowe ... ..	75	29	250
65	20	Dongola ... ..	60	22	220
66	22	Dongola ... ..	65	24	220
67	30	Muglad ... ..	63	30	230
68	27	Geili ... ..	64	30	250
69	23	Shendi ... ..	56	27	220
70	28	Dilling ... ..	65	23	250
71	20	Atbara ... ..	58	32	235
72	23	Dongola ... ..	60	20	190
73	21	Dongola ... ..	65	22	170
74	20	Khartoum ... ..	55	18	200
75	21	Dongola ... ..	68	18	200
76	20	Dongola ... ..	62	20	185
77	28	Gedaref ... ..	65	30	180
78	21	Geneina ... ..	45	34	160
79	20	Gezira Aba ... ..	61	32	200
80	20	Dongola ... ..	61	32	150
81	21	Muglad ... ..	50	36	170
82	22	Shendi ... ..	40	28	184
83	22	Khartoum ... ..	48	30	216
84	21	Omdurman ... ..	42	22	200
85	22	Khartoum ... ..	46	25	248
86	24	Medani ... ..	64	26	264
87	22	Shendi ... ..	50	20	200
88	21	Shendi ... ..	58	28	210
89	21	Shendi ... ..	60	24	190
90	21	Khartoum ... ..	45	23	250
91	20	Dongola ... ..	42	25	270
92	20	Khartoum ... ..	55	27	280
93	27	Dilling ... ..	62	29	260
94	25	Merowe ... ..	60	26	200
95	23	Nyala ... ..	70	20	260
96	23	Atbara ... ..	52	28	185
97	22	Atbara ... ..	49	20	175
98	22	Dongola ... ..	49	30	240
99	26	Dongola ... ..	56	25	200
100	30	Kordofan ... ..	70	24	165

## Sensitivity of Bacteria to Sulpha-Drugs and Antibiotics :

There is a marked demand for sensitivity tests from the various hospitals. The opportunity was taken of the appearance of few cases of Cerebro-spinal meningitis in Khartoum Province and sensitivity tests were carried out on the isolated strains. The results of the sensitivity tests were as follows :—

Table No. 3

Sulpha-drugs	..	..	..	..	..	..	++++
Chloranphinocol	..	..	..	..	..	..	+++
Erythromycin	..	..	..	..	..	..	+++
Terramycin	..	..	..	..	..	..	++
Aureomycin	..	..	..	..	..	..	+
Streptomycin	..	..	..	..	..	..	++
Penicillin ..	..	..	..	..	..	..	0

It would thus appear that while penicillin has no effect on the prevailing strains of Meningococci in Khartoum Province, Sulpha-drugs, Chloromycetin, Erythromycin and Streptomycin are lethal in vitro in this order and they are, therefore, recommended to be the drugs of choice in treatment.

Sensitivity tests were carried out on 10 local strains of *B. Coli* picked at random from cultures of urine, vaginal swabs and water samples sent for routine examination. Diameter of inhibition zone expressed in m.m. The results were as follows :—

TABLE NO. 4

Antibiotic	...	1	2	3	4	5	6	7	8	9	10
Penicillin ...	...	0	0	0	0	0	0	0	0	0	0
Chloromycetin	...	30	28	30	0	12	30	—	28	30	27
Streptomycin	...	18	22	20	20	22	18	18	20	27	20
Terramycin	...	15	15	15	15	15	17	0	17	17	16
Tetracyclin	...	15	18	22	18	16	16	0	18	20	16
Aureomycin	...	16	12	16	0	0	17	0	0	0	15
Erythromycin	...	20	17	17	18	22	18	17	20	20	18
Novobiocin	...	—	—	16	0	0	0	0	0	15	0
Sigamycin	...	20	20	24	22	21	24	16	24	24	22
Neomycin	...	18	14	20	20	20	22	20	18	20	22
Kanamycin	...	20	22	22	22	20	22	24	22	22	20
Oleandomycin	...	17	—	—	15	14	14	0	15	15	—
Magnamycin	...	13	13	0	15	12	0	15	0	16	0
Spiramycin	...	0	0	0	0	0	0	0	0	15	0
Furadantin	...	20	20	17	22	20	16	20	17	18	15
Bacitracin...	...	0	0	0	0	0	0	0	0	0	0
Sulfonamid	...	0	0	0	0	0	0	0	0	0	0
Ristocetin	...	0	0	0	0	0	0	0	0	0	0
Polymyxin	...			13	12	13	12	12	—	12	14
Albamycin	...			13	0	0	12	0	12	0	13



TABLE 5

Sensitivity tests were carried out on 10 local strains of *Staphylococcus Pyogenes* picked at random from local cultures of pus swabs sent. The results are tabulated as follows :—

Antibiotic	...	1	2	3	4	5	6	7	8	9	10
Penicillin	...	35	0	0	+	14	0	28	35	0	
Chloromycetin	...	32	31	30	32	32	30	34	32	30	34
Streptomycin	...	26	24	22	26	26	0	28	26	26	28
Terramycin	...	26	25	27	26	27	24	30	27	28	30
Tetracyclin	...	30	28	28	28	29	27	27	28	28	30
Aureomycin	...	22	21	21	22	24	20	24	24	24	24
Erythromycin	...	30	30	35	31	34	30	32	35	32	38
Novobiocyn	...	32	31	33	34	34	30	27	32	35	38
Sigmamycin	...	32	28	32	32	32	31	32	30	35	34
Neomycin	...	26	25	25	26	24	26	26	26	28	26
Kanamycin	...	27	27	27	27	30	27	28	28	30	30
Oleandomycin	...	30	28	30	30	38	30	30	32	30	35
Maganamycin	...	30	28	28	28	30	28	28	28	32	32
Spiramycin	...	24	24	24	23	27	24	25	26	22	27
Furadantin	...	24	22	24	24	25	22	22	24	20	25
Bacitracin...	...	18	20	20	22	21	17	15	20	+	24
Sulfonamid	...	0	0		15	21	13	21	0	0	0
Ristocetin	...	15	17	15	17	16	15	15	16	15	20
Polymyxin	...	+	+	+	+	0	0	12	+	+	+
Albamycin	...	22	22	22	23	24	24	15	0	25	30

## ANTIBIOTICS ASSAY

A large number of antibiotics has now reached the Sudan and is being used for treatment. The sensitivity of all antibiotics available in the market was tested against various organisms and the result was tabulated as follows :—

TABLE 6

ANTIBIOTICS	Oxford Staph	S. Typhi To 901	B. Col Local	P. Proteous Local	B. Pyocy-aneous Local	Staph Aureous Local Strain
Penicillin	38	0	0	0	0	0
Chloromycetin	40	40	28	24	20	32
Streptomycin	32	34	18	22	25	25
Terramycin	34	30	16	0	14	28
Tetracyclin	36	32	18	13	16	27
Aureomycin	25	24	0	0	0	18
Erythromycin	40	26	22	14	18	32
Novobiocyn	36	18	0	16	0	32
Sigmamycin	40	34	22	16	18	32
Neomycin	32	32	20	22	22	25
Kanamycin	34	34	26	24	18	28
Oleandomycin	40	18	13	0	0	30
Magnamycin	35	14	0	0	0	27
Spiramycin	30	0	0	0	0	30
Furadantin	30	30	18	0	0	24
Bacitracin	22	0	0	0	0	20
Sulfanomid	24	24	0	0	0	24
Ristocetin	15	0	0	0	0	15
Polymyxin	0	17	0	0	14	12

## POLIOMYELITIS

An epidemic of poliomyelitis started in Khartoum Province in August, 1959. The number of cases seen was about 120. The age incidence was as follows :—

74 per cent of the cases occurred in the age group of 1 1/2 to 3 years. The youngest case was 4 months and the oldest case was 7 years old. Virological investigations were kindly carried out for us by Dr. J. H. S. Gear, of the Poliomyelitis Research Foundation. Specimens of faeces from paralytic cases were kept in screw-capped containers wrapped in water-tight plastic bags and placed in dry ice and sent by air to Dr. Gear. 35 specimens of stools were examined and the results were as follows :—

Type of Virus	No. of Cases
Type 1 .. .. .	5
„ 2 .. .. .	Nil
„ 3 .. .. .	2
Group A Coxsacki .. .. .	3
„ B „ .. .. .	1
Unknown Virus .. .. .	3
Virus not Isolated .. .. .	21

## SEROLOGICAL TESTS

Blood from 20 cases was collected by renules both at the acute and convalescent stages. The results are shown below in table form :

Type of Virus	No. of Cases
Type 1 .. .. .	17
„ 2 .. .. .	1
„ 3 .. .. .	2
„ 1, 2 and 3 .. .. .	5
„ 1 and 3 .. .. .	5
„ 2 and 3 .. .. .	1

This is the first time in Khartoum when poliomyelitis occurred in epidemic form. Previous investigations showed that the disease is endemic and wide-spread (Haseeb, 1959).

# SUMMARY OF LABORATORY EXAMINATIONS

## 1959—1960

MONTL.	Kahn Test	Blood	Faeces and Urine	Gen. Bact. and Bioch.	Histo- Path.	TOTAL
July ... ..	1,334	487	425	733	80	3,059
August ... ..	1,339	561	739	769	70	3,478
September ... ..	1,012	901	846	1,180	59	3,998
October ... ..	1,864	1,405	879	1,265	65	5,478
November ... ..	1,268	788	729	891	52	3,728
December ... ..	1,796	654	681	837	91	4,059
January ... ..	1,136	552	483	795	91	3,057
February ... ..	1,362	430	411	1,047	97	3,347
March ... ..	1,000	359	404	859	113	2,735
April ... ..	1,406	360	398	961	218	3,122
May ... ..	1,551	445	533	1,002	229	3,940
June ... ..	1,199	499	512	827	149	3,170
TOTAL	16,267	7,441	7,040	11,166	1,314	43,228

### Rabies Examination

Decomposed	...	...	...	...	81
Positive ... ..	...	...	...	...	263
Negative ... ..	...	...	...	...	21
TOTAL					365

### Vaccines issued during 1959/60 :

T.A.B. ... ..	...	...	...	...	74,500 ml.
Anti Rabie ... ..	...	...	...	...	788,900 ml.
Staphylococcus :					
Doses of vaccine Lymph	...	...	...	...	1,882,900 doz.



URINE

	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	Total
T.	—	—	—	—	—	—	—	—	—	—	—	—	—
A.	—	—	1	—	—	—	—	—	—	—	—	—	1
B.	—	—	—	—	—	—	—	—	1	—	—	—	1
M.	—	—	—	—	—	—	—	—	—	—	—	—	—
Ova	—	2	—	—	—	—	—	—	—	3	—	1	6
Negative	243	368	408	434	373	356	287	246	247	246	337	305	3,850
Monthly Total...	243	370	409	434	373	356	287	246	248	249	337	306	3,858

	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	Total
C.S. Fluids ...	32	26	19	34	46	35	35	34	Pos. 1 Neg. 28.	Pos. 8 Neg. 45	Pos. 25 Neg. 96	Pos. 32 Neg. 91	587
C. Diph.													
Positive ...	4	15	62	61	34	24	14	12	20	6	12	1	265
Negative ...	116	159	545	599	350	264	251	316	179	198	198	144	3,319
Virulence Tests ...	—	—	—	—	—	—	—	—	—	—	—	—	—
Sputa													
Positive ...	46	3	6	1	7	3	2	2	2	1	4	2	79
Negative ...	14	16	15	16	21	20	23	23	28	24	35	8	243
Gem. Bact. ...	332	360	351	374	257	311	297	330	255	299	272	299	3,737
Biochem. ...	189	190	182	180	176	180	173	330	346	380	360	250	2,936
TOTAL ...	733	769	1,180	1,265	891	837	795	1,047	859	961	1,002	827	11,166

WIDAL REACTIONS

	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	TOTAL
T.	16	66	64	56	93	54	47	30	14	29	47	4	520
A.	—	2	34	—	1	—	3	1	1	1	1	—	44
B.	1	4	7	8	—	—	2	5	1	1	4	—	33
M.	6	1	7	3	13	4	4	9	8	7	12	6	80
Negative	272	230	282	333	295	286	271	183	152	169	197	268	2,938
TOTAL	295	303	394	400	402	344	327	228	176	207	261	278	3,615

BLOOD CULTURE

	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	TOTAL
T.	12	7	3	12	10	6	6	1	1	1	1	5	65
A.	—	1	1	3	2	1	4	—	—	—	3	1	16
B.	—	—	—	—	—	2	—	1	—	—	—	—	3
O.O.	15	17	4	8	7	15	—	6	1	12	6	4	95
Streps.	—	—	—	2	—	2	—	—	1	2	—	1	8
Sterile	68	69	112	140	92	48	57	68	67	42	62	82	907
Contaminated	75	93	104	140	103	81	87	61	37	30	65	67	943
TOTAL	170	187	224	305	214	155	154	137	107	87	137	160	2,037



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MALARIA

	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	Total
M.T. ...	—	6	2	93	3	6	4	—	—	—	—	—	114
B.T. ...	—	—	—	—	—	—	—	—	—	—	—	1	1
Q.T. ...	—	—	—	—	—	—	—	—	—	—	—	—	—
D.I. ...	—	—	—	—	—	—	—	—	—	—	—	—	—
Negative ...	9	30	249	565	147	135	40	41	56	49	27	44	1,392
TOTAL ...	9	36	251	658	150	141	44	41	56	49	27	45	1,507
K.A. ...	—	4	2	—	—	—	—	—	—	—	—	—	6
R.F. ...	—	—	—	—	—	—	—	—	—	—	—	—	—
Blood Counts ...	13	31	30	40	20	14	27	24	20	17	20	12	268
TOTAL ...	13	35	32	40	20	14	27	24	20	17	20	12	274
Weil-Felix : Positive ...	—	—	—	—	—	—	—	—	—	—	—	—	—
Negative ...	—	—	—	—	—	—	—	—	—	—	—	—	—
TOTAL ...	—	—	—	—	—	—	—	—	—	—	—	—	—
Heterophile : Positive...	—	—	—	—	—	—	—	—	—	—	—	—	—
Negative ...	—	—	—	2	2	—	—	—	—	—	—	4	8
TOTAL ...	—	—	—	2	2	—	—	—	—	—	—	4	8
MONTHLY GRAND TOTAL	22	71	283	700	172	155	71	65	76	66	47	61	1,789

1958/59

FAECES

	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	TOTAL
Flexneri	3	—	2	4	1	3	—	2	3	2	2	—	22
Shiga	1	1	1	8	2	3	—	—	1	2	2	—	21
B. Alkalescens	—	—	—	2	—	—	—	—	—	—	—	—	2
Ambigium	—	—	—	—	—	—	—	—	—	—	—	—	—
Sonne	2	—	1	—	—	—	—	—	1	1	—	1	6
T.	2	3	1	5	6	2	1	—	7	—	—	4	31
A.	1	—	—	—	—	—	—	1	—	—	—	—	2
B.	1	—	—	1	1	—	—	1	—	—	—	—	4
Amoeba	—	—	—	1	—	2	—	1	1	—	—	—	8
Ova	—	2	4	3	4	6	1	1	—	3	1	1	26
Negative	172	363	428	421	342	309	194	160	142	138	191	200	3,060
MONTHLY TOTAL	182	369	437	445	356	325	196	166	155	149	196	206	3,182

# KAHN TESTS

	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	Total
Positive...	166	218	152	183	183	298	124	214	134	158	163	114	2,107
Negative	1,168	1,121	860	1,681	1,085	1,498	1,012	1,148	866	1,248	1,388	1,085	14,160
TOTAL ...	1,334	1,339	1,012	1,864	1,268	1,796	1,136	1,362	1,000	1,406	1,551	1,199	16,267



*Appendix "O"*

**LIST OF PUBLICATIONS DURING THE YEAR BY MEMBERS OF THE STAFF**

Name and Initials of Author	Date of Publication	Title of Article	Title of Journal in which Published	Volume Number of Journal	Page Number of Journal
M.A. Haseeb	Sept., 1959	The History of Kala-Azar in the Sudan.	El Hakeim		
M.A. Haseeb	March, 1960	Epidemiological Statistics	Biopsy Review	1	1
M.A. Haseeb, M.H. Satti and Ali Kheir	May, 1960	Preliminary Report on an Outbreak of Yellow Fever in the Southern Fung	El Hakeim	8	18
M.M. Hassan and M.A. Haseeb	In the Press	Poliomyelitis in Khartoum	Journal of Tropical Medicine and Hygiene		
Mirghani Yousif Ali	In the Press	Development and Future of Forensic Medicine in the Sudan.	El Hakeim		
Mirghani Yousif Ali	March, 1960	Biopsy Review	Journal issued by the Department of Pathology S.M.R.L.	Vol. 1 No. 1	
M.H. Satti	In the Press	Kala-Azar in the Sudan and Tropical Africa. (Paper read before the 6th Inter. congresses of T. Med. and Malaria).	Proceedings of the 6th International Congresses of Trop. Med. and Malaria Lisbon-Portugal.		
M.H. Satti and B.M. Honigberg	1959	Observation on Thermal Resistance of Trichomonas Gallinae and T. Vaginalis.	American Journal of Parasitology	Vo. 45 Number 4	No. 113 Page 51
M.H. Satti	1960	Report on Onchocerciasis in Bahr El Ghazal.	El Hakeim	—	—
M.H. Satti	1960	<i>Discussion</i> : Aetiology of the Blindness in Onchocerciasis.	Proceedings 6th International Congresses. Tropical Medicine and Malaria Lisbon-Portugal.	II Vol. 38	326

## (b) MEDICAL ENTOMOLOGY

By

M. QUTUBUDDIN

As usual, this year the work in the Section continued on more or less the same lines as in the year 1958—1959.

1. Identification of Anopheline and Culicine larvae and adults collected by the staff of the Section and those sent for identification.

2. Collection and identification of sandflies from the Fung area and Gedaref continued.

3. Studies on the estimation of density of the green *Nimitti Tanytarsus lewisi* continued during its season.

4. Studies on the biology biting habits etc. of *Simulium* were done by the Medical Entomologist in the Northern Province at Abu Hamad and a report submitted on it.

5. Due to an outbreak of a yellow fever epidemic in the Southern Fung, the Medical Entomologist visited the area twice; for about 6 days in early and two weeks in late November, 1959. The collection was identified and reports submitted to the Ministry and the Assistant Director of Research.

### Mosquitoes

Mosquitoes collected and sent from many parts of the country were identified and reports sent; the list is given in Appendix A. In all, 4 Anopheline species, 8 species of *Culex*, one of *Aedes*, and one, that of *Eretmapodites*, were recognised. Mosquitoes, collected in the Fung Area at the time when the yellow fever epidemic was finishing, were also identified. They comprised:—

- (1) *Anopheles gambiae*
- (2) *A. coustani*
- (3) *A. pretoriensis*
- (4) *C. pipiens pipiens*
- (5) *C. bitaeniorhynchus*
- (6) *C. tigripes*
- (7) *C. simpsoni*.
- (8) *C. univittatus*
- (9) *C. duttoni*
- (10) *Aedes aegypti*

The one instance of *Aedes aegypti* occurring in the area in rockholes is interesting although it is not unprecedented. Wadi Halfa, where *A. gambiae* has been exterminated since 1945, continues to be free from the vector.

Three strains of *Aedes aegypti* are being successfully reared in the hatchery for experiments with insecticides, etc.



## Sandflies

Sandflies collected from various places in Fung area have been identified and a report sent to the Director, Medical Services and the Assistant Director of Research, Khartoum. They comprised the following species.

- (1) *Sergentomyia africans.*
- (2) *S. antennata.*
- (3) *S. schwetzi.*
- (4) *S. clydei var. latiterga.*
- (5) *S. bedfordi.*

From Jebel Tozi

- (6) *P. darlingi*
- (7) *P. bergeroti*
- (8) *P. langeroni orientalis*

A brief explanation of the change of the generic name from *Phlebotomus* to *Sergentomyia* is that Theodor (1948) had proposed the splitting up of the genus *Phlebotomus* into two genera. In a recent publication Theodor (1958) (in his Monographic work on the sandflies of Palaearctic Region is German) has already adopted this new nomenclature viz, has raised *Sergentomyia* to the status of a genus which will contain all those species which were formerly included in the subgenera *Sergentomyia* and *Sintonius*, thus restricting *Phlebotomus* to those species that formed the rest while subgenus *Phlebotomus* s. str., as classified by others and accepted by Kirk and Lewis. The name of the species *P. clydei* is now changed to *Sergentomyia clydei* s.sp. *latiterga*. Theodor, since the form found in the Sudan, and for that matter in Africa, is clearly distinct from the Indian form in the morphology of the male.

During the course of study of sandflies from Wad el Shajra, Gedaref, in a lot collected from the area, there were two males and two females of *P. heischi* (Kirk and Lewis). This species has never before been reported from the Sudan nor has the male been known to science before. It is quite distinct from that of *P. lesleyae* with which the species exhibit close affinities. It has been described in a short paper which is sent to the Director, Medical Services for approval for its publication in the Annals and Magazine of Natural History, London.

## The Green Nimitti

Collections of larvae and pupae were made by tow-net this year also from the Nile both at Medani and Khartoum. The figures are given in the Appendix. . . . A paper on the control of green nimitti in the Blue Nile, in collaboration with Prof. Brown and others, has been sent for publication. This article embodies the results of DDD treatment of Sennar carried out in November, 1957.

## Simulium

In order to study the various aspects of the biology of *Simulium damnosum* in the field, studies were made at Abu Hamad. This place was selected among others because there is a very large supply of adult *Simulium damnosum* available for dissection any time during the day. The flies collected at Abu Hamad, Abu Teen, Mograt East and around these places were collected while biting. These were dissected for the study of condition of the different parts of the insect which



throw light on the state of its infectivity, age, etc. A detailed report on this has been submitted (see letter ME 4.4 dated 2.4.1960). To sum up, it has been concluded that a high percentage of flies caught biting in the forenoon are parous as compared with those taken in the afternoon. In respect of control which has been discussed at some length in the aforesaid report larvicidal control is preferred to a campaign against the adult. The pupa is known to be unaffected by DDT although Lindane (BHC) is believed to kill it. Larvae are killed by a concentration of 0.5 ppm p-p isomer DDT in river water and sterilisation could be achieved for about 40 miles delivered over a period of 30 mins.

## **Hatchery**

Laboratory colonies of three strains of *Aedes aegypti* (L) are being maintained in the hatchery. They are the normal London strain brought from the London School of Hygiene and Tropical Medicine in 1958 by the Medical Entomologist and the normal Sudan strain from El Obeid and the DDT resistant Trinidad strain also from the L.S.H.T.M. They are used for testing insecticides in the Laboratories. Several experiments mostly on adults were made this year.

Preliminary susceptibility tests performed on lice collected from a village near Medani showed that no resistance to DDT was detectable in the insect so far. Experiments were conducted with the standard W.H.O. kit with 0.04% D.D.T. Two strains of housefly, one from Medani and the other from Omdurman, are also being maintained in the hatchery.

## **Publications**

Details of the publications from the Section are given in the attached form O.

## **Training**

Health visitors and nursing staff visited the Section for demonstrations, etc. Training was given to P.H.O. and one mosquito-man in the Section during the year.

## **Sandflies**

After completing the above account the hitherto female of *P. darlingi* was collected from Jebel Tozi, Wad en-Nil which is described in a separate paper. This species was described by Lewis and Kirk as a single male and the female was unknown. During the study of sandflies certain abnormal structures were noted in 5 different species which have been numbered and described. The paper has been sent to the Ministry of Health for approval to publish it.

# Appendix " A "

PLACE	Ref. No.	Identification	Remarks
Yei ... ..	2116	<i>Culex nebulosus</i>	
" ... ..	"	" <i>tigripes</i>	
" ... ..	"	<i>Aedes aegypti</i>	
" ... ..	"	<i>Eretmapodites chrysogaster</i>	
Medani ... ..	2120	<i>Aedes aegypti</i>	
Gedaref ... ..	2122	<i>Culex simpsoni</i>	Khor Dod
" ... ..	"	" <i>univittatus</i>	" "
Basunda ... ..	"	" "	
Suakin ... ..	2123	<i>Aedes aegypti</i>	
Atbara ... ..	2121	<i>Culex pipiens fatigans</i>	
Tileih ... ..	"	" " "	Atbara area
Atiri ... ..	"	" <i>univittatus</i>	
Farka ... ..	"	" "	
" ... ..	"	" <i>pipiens fatigans</i>	
" ... ..	"	" <i>tigripes</i>	
Akasha ... ..	"	" <i>pipiens fatigans</i>	
Khor Agorma ... ..		<i>Anopheles gambiae</i>	
" " ... ..		" <i>coustani</i>	
" " ... ..		<i>Culex pipiens pipiens</i>	
Khor on the way to Guffa village ... ..		" <i>bitaeniorphynchus</i>	
" " " ... ..		" <i>poicilipes</i>	
" " " ... ..		" <i>simpsoni</i>	
Roseires Cement Tank		" <i>univittatus</i>	
Kurmuk ... ..		" <i>tigripes</i>	
" ... ..		" <i>simpsoni</i>	
" ... ..		<i>Aedes pretoriensis</i>	
Khor Osman El Roseires		<i>Culex univittatus</i>	
Surkam Zeer ... ..		<i>Culex laticinctus</i>	
Khor Amsak ... ..		" <i>sp. immature</i>	
Kurmuk El Zariba ... ..		" <i>poicilipes</i>	
" " " ... ..		<i>Aedes species</i>	
Do Khor Al Ahmar ... ..		" <i>gambiae</i>	
" " " " ... ..		<i>Culex tigripes</i>	
" " " " ... ..		" <i>univittatus</i>	
Do Khor El Badawi ... ..		" <i>sp. immature</i>	
" " " " ... ..		" <i>duttoni</i>	
Kurmuk ... ..		"	
Do Wad Juma Barka ... ..		" <i>univittatus</i>	
Khor Yabus ... ..		"	
Rock Holes ... ..		" <i>duttoni</i>	
" " ... ..		<i>Aedes vittatus</i>	
Kurmuk ... ..		" <i>aegypti</i>	
Deim Mansour ... ..		" <i>vittatus</i>	
Kurmuk Khor			
Fulus Rock Holes ... ..		<i>Anopheles sp.</i>	
Aus — Rock Holes ... ..		<i>Culex duttoni</i>	

TABLE

Date of Collection	Name of Place	<i>Sergentomyia</i> <i>africans</i>		<i>S. antennata</i>		<i>S. schwetzi</i>		<i>S. bedfordi</i>		<i>S. clydei</i> <i>var. latiterna</i>		REMARKS
15. 8.59	Roseires ...	m	f	m	f	m	f	m	f	m	f	The genus <i>Phlebotomus</i> has been recently split up into two.
		21	28	36	28	3	1	7	12	23	8	
13. 2.59	Bao ...	1	0	12	11			2	3			
28.12.58	Gerawe ...			24	23					14	5	genera viz., (1) <i>Phlebotomus</i> and (2) <i>Serbentomyia</i> .
	Bogg ...	12	18	8	11			15	29			
		34	46	80	73	3	1	24	44	37	13	



Appendix " O "

LIST OF PUBLICATIONS DURING THE YEAR BY MEMBERS OF THE STAFF

Name and Initials of Author	Date of Publication	Title of Article	Title of Journal in Which Published	Volume Number of Journal	Page Number of Journal
1. A. W. A. Brown, McKinley, Bedfordi and Qutubuddin.	In the Press	Control of Green Nimitti in the Blue Nile.	Bull. Ent. Res.	—	—
2. M. Qutubuddin.	Sent to Min. of Health for Approval.	A Description of the Hitherto Unknown Male of <i>P. heischi</i> .	Annals & Mag. Nat. Hist.	—	—
3. Do.	Do.	Some Abnormalities, in Sandflies.	Do.	—	—
4. Do.	Do.	A Description of the Hitherto Unknown Female of <i>P. darlingi</i>	Do.	—	—

## (c) THE WELLCOME CHEMICAL LABORATORIES

*By*

ABDEL HAMID IBRAHIM

The Wellcome Tropical Research Laboratories were founded in 1903. The Laboratories and the equipment together with a small library and museum were a gift to the Sudan Government by the late Sir Henry Wellcome and they were housed in the Gordon Memorial College (now the University).

Dr. William Beam was appointed in 1904 as the first Government Chemist and the Chemical Section was then opened. After the First World War, the Chemical Section expanded rapidly and branch laboratories were opened at Atbara and Wad Medani.

In 1935, the Wellcome Tropical Research Laboratories, Khartoum were disbanded and the Khartoum Chemical Laboratories were placed under the control of the Ministry of Agriculture. In 1939 the Laboratories were transferred to the Ministry of Health and they now form part of the Research Section of the Ministry.

## **STAFF**

(on 30th June, 1960)

### **Government Analyst**

Abdel Hamid Ibrahim Suleiman, M.Sc. (London) D.I.C.

### **Assistant Government Analysts**

Riad Mansour

Rifaat Butros Salama, M.Sc. (London) D.I.C.

(1 Vacancy)

### **Assistant Scientific Officers**

Mubarak Ali Karrar, B.Sc. (London)

(on study leave in U.K.)

(1 Vacancy)

### **Senior Technical Assistants**

Afifi Ahmed Hussein

Abu Bakr Ahmed Akour

Ahmed Abdulla Nagi

### **Technical Assistants**

Mahdi El Tayeb Haboura

Hassan Ahmed Yasin

Salah El Din Bedawi El Sawahli

Mahmoud Abdel Ghaffor

Ali El Hag Ibrahim

### **Junior Technical Assistants**

El Tahir Bedawi

Fedul El Rayih

(1 Vacancy)

### **Librarian**

El Fatih El Tahir Diab

### **Clerk**

Abdulla Osman



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## ADMINISTRATIVE REPORT

### 1. Staff

(i) Sayed Rifaat Butros Salama completed his training courses in different forensic laboratories in U.K. and returned on 12.8.1959. He assumed his duties in a forensic and Drug Section of the Laboratories. His return has considerably improved the staff position of the Laboratories.

(ii) Junior Technical Assistant, Ali Eff. El Hag Ibrahim has been promoted to the vacant post of Technical Assistant in the Commercial Section.

The position with regard to staff has remained critical. Although the return of Sayed Rifaat has improved the situation considerably, we were still unable to fill many of the vacancies. One University graduate who applied for the post of A/Scientific Officer, the first in four years, was redirected for employment to the Ministry of Finance by the Employment Bureau.

On the other hand plans are being made for staffing the new Pharmaceutical Control Section on its establishment within the next two years. We hope by then we shall find enough graduates for all the posts of A/Scientific Officers.

At the moment a great strain is put on the staff who try desperately to cope with the ever increasing volume of work, which, as will be seen, has increased beyond reasonable proportions.

### 2. General

#### (i) Premises

The premises have remained as they were last year and hence have become more congested with new acquirements. Plans for evacuating the River Hospital are delayed until new quarters are constructed for the patients occupying the River Hospital.

The Water Laboratory has been moved to a remote new Laboratory room to avoid air contamination by vapours from other laboratories. The Water Laboratory room is being used for instruments used in every-day routine and glass blowing.

#### (ii) Equipment

The Polarograph sent for repair two years ago has been returned. A glass blowing machine, a tropical pH Meter and Milivoltmeter, a phase contrast and dark field microscope, a cabinet refrigerator and three new ovens are among the instruments acquired. Most of the missing items in glass-ware and chemicals also arrived.

#### (iii) Library

New books and booklets have been acquired. New book-cases are being made to take the increasing number of reference books and papers.

Visitors to the Library have also shown a marked increase. These were exclusively from the University and other Government Departments.



## ANALYTICAL REPORT

### 1. Summary

The following table shows the number of samples received in different categories during the last two years :—

	1959/60	1958/59
Waters and Sewages ... ..	403	319
Foods ... ..	396	388
Drugs and Pharmaceuticals ... ..	52	30
Toxicological Specimens ... ..	118	183
Forensic Specimens ... ..	35	13
Edible Oils, Seeds and Oil Cakes ... ..	1,728	925
Damaged Materials ... ..	372	186
Miscellaneous ... ..	213	156
<b>TOTAL ... ..</b>	<b>3,406</b>	<b>2,248</b>

Hence the year has shown a vast increase in the number of samples submitted to the Laboratories (over 50%). This increase was mostly in Edible Oils, Oilseeds and Cakes, Damaged Materials, Clinical and Forensic specimens. This increase was a heavy burden on the staff whose establishment has shown no increase over the last eight years.

Anyway such increase in work shows the new interest many Government and Private Establishments are taking in scientific investigation. This attitude is bound to increase with the fast growth in local industry and the import and export business. We hope to keep up the pace by planning the necessary expansion in various sections of the Laboratories.

	1959/60	1958/59
Ministry of Health ... ..	651	541
„ „ Agriculture ... ..	60	83
„ „ Animal Resources ... ..	25	29
„ „ Commerce, Industry and Supply ... ..	4	6
„ „ Communications ... ..	33	26
„ „ Education ... ..	43	0
„ „ Finance and Economics ... ..	13	29
„ „ Mineral Resources ... ..	0	0
„ „ Social Affairs ... ..	0	1
„ „ Stores and Equipment ... ..	55	18
„ „ Works ... ..	148	207
Mechanical Transport Department... ..	1	0
Museum ... ..	0	0
Sudan Army ... ..	3	3
Sudan Police ... ..	59	61
Local Authorities ... ..	18	6
Khartoum University ... ..	5	6
Sudan Gezira Board ... ..	33	61
Equatoria Projects Board ... ..	1	0
Province Governors ... ..	0	5
Commercial Firms and Others ... ..	2,284	1,152

The analytical fees for commercial work totalled LS. 4,846.612 m/ms. compared with LS. 2,958.584 m/ms. for last year.

Fees from Government Departments apart from the Ministry of Health totalled LS. 2,413.625 m/ms. compared with LS. 1,659.035 m/ms. for last year.



We still feel that the fees charged for analyses are heavily subsidised by the Ministry. Similar work is done in private Laboratories abroad for five to ten times the fees we charge.

## Water and Sewages

Samples of Waters and Sewages were received from the following sources :—

	1959/60	1958/59
Ministry of Health ... ..	136	70
Drilling Engineer, M. of Works ... ..	146	188
Sudan Gezira Board ... ..	5	4
Khartoum Main Drainage Contracts ... ..	5	0
Other Sources... ..	111	57
TOTAL ... ..	403	319

There is a slight increase in the number of samples over the last year, but still below 1957/58. The slight increase is practically all due to water samples submitted by various private sources, mostly from industry.

It is also noted that the Public Health Authorities did not make full use of our facilities to check all wells and boreholes all over the country. It is hoped that next year clinical surveys of areas with waters of high nitrates content and alkalinity could be started to enable us to revise our present limits.

### a) Bore-holes and Wells

The following table gives details of some of the unusual waters received during the year :—

Sample No.	Sources	Province	Remarks	p.p.m.	
E. 7	Bore, Garagin	Blue Nile	Sulphates as SO <sub>4</sub> ... ..	...	1,150
E. 52	Bore No. 1011, Gedaref	Kassa a	Nitrates as N.... ...	...	80
E. 249	Flood, Atbara	Kassala	Nitrates as N.... ...	...	140
E. 318	Well, Khor Grinti	Bahr El Gazal	Ammoniacal as N. ... ..	...	1.5
E. 336	Bore, Rahad	Kordofan	Nitrate as N.... ...	...	100
E. 342	Bore, Rahad (El Bulk)	Kordofan	Nitrates as N.... ...	...	160
E. 402	Bore 898, Rahad	Kordofan	Nitrates as N.... ...	...	150
E. 743	Bore 882, Mikheizina II	Kordofan	Nitrates as N.... ...	...	150
E. 746	Bore, Gedaref (Mitchell Cottis)	Kassala	Nitrates as N.... ...	...	100
E. 918	Well No. 4, Omdurman (Medical Corps)	Khartoum	Nitrates as N.... ...	...	125
E. 919	Well No. 5, Omdurman (Medical Corps)	Khartoum	Nitrates as N.... ...	...	100
E. 1015	Bore, 892 Samandia	Kordofan	Nitrates as N.... ...	...	125
E. 1464	Bore, 1034 Um Taba I	Blue Nile	Nitrates as N.... ...	...	125
E. 1541	Open Well Bint Juda B.	Kordofan	Nitrates as N.... ...	...	300
E. 1542	Open Well Bint Juda A	Kordofan	Nitrates as N.... ...	...	130

Sample No.	Sources	Province	Remarks			p.p.m.
E. 1834	Open Well Meiyas No. 3	Kassala	Total Solids ...	...	...	8,600
			Sulphates as SO <sub>4</sub> ...	...	...	1,100
			Nitrates as N....	...	...	330
E. 1835	Open Well Musmor No. 2	Kassala	Total Solids ...	...	...	9,350
			Sulphates as SO <sub>4</sub> ...	...	...	1,200
			Nitrates as N....	...	...	2,000
E. 1839	Well, Gedaref (El Gonio Well)	Kassala	Nitrates as N....	...	...	130
E. 1840	Well, Gedaref (Council Well)	Kassala	Nitrates as N....	...	...	150
E. 1841	Well, Gedaref (Gallyeen Well)	Kassala	Nitrates as N....	...	...	120
E. 1996	Bore No. 1076 Jebel Hilla	Darfur	Total Solids ...	...	...	12,840
			Sulphates as SO <sub>4</sub> ...	...	...	3,500
E. 2176	Bore No. 1042 Zarahib	Kordofan	Total Solids ...	...	...	5,040
E. 2183	Open Well Hashab	Kordofan	Nitrates as N....	...	...	130
E. 2306	Open Well Suakin (El Shatti)	Kassala	Nitrates as N....	...	...	200
E. 2307	Open Well Suakin (M. of Works)	Kassala	Total Solids ...	...	...	4,800
			Sulphates as SO <sub>4</sub> ...	...	...	1,630
E. 2309	Open Well Suakin (Central Prison)	Kassala	Total Solids ...	...	...	4,400
			Sulphates as SO <sub>4</sub> ...	...	...	1,440
E. 2510	Open Well Sinkat (Private)	Kassala	Nitrates as N....	...	...	130
E. 2636	Well, Gedaref (Private)	Kassala	Nitrates as N....	...	...	100
E. 2638	Well, Gedaref (Private)	Kassala	Nitrates as N....	...	...	80
E. 2639	Well, Gedaref (Private)	Kassala	Nitrates as N....	...	...	100
E. 2641	Well, Gedaref (Private)	Kassala	Nitrates as N....	...	...	100
E. 2642	Well, Gedaref (Private)	Kassala	Nitrates as N....	...	...	100
E. 2643	Well, Gedaref (Private)	Kassala	Nitrates as N....	...	...	160
E. 2644	Well, Gedaref (Private)	Kassala	Nitrates as N....	...	...	140
E. 2795	Well, Gala El Bagar	Kordofan	Total Solids ...	...	...	3,950
			Sulphates as SO <sub>4</sub> ...	...	...	1,920

Still more and more nitrates are the main objection in passing the waters as fit for human consumption. Sulphates have also caused various symptoms of diarrhoea and many such cases were reported from the use of water from Galaa El Bagar Well (E. 2795). The alkalinity problem did not figure during the whole year in new bores.

#### (b) Khartoum Mains and River Waters

The normal routine of analysing the monthly samples from Khartoum Mains, Blue Nile and White Nile was continued. The results are tabulated in the Appendix at the end of this Report.

#### (e) Distilled Water

Samples of distilled water were also analysed during the year for private concerns. The quality of these has shown great improvement, mainly because of the fact that purchasers have laid down their own standards and adopted the practice of sending samples periodically for analysis.



3. FOODS

The following samples were received during the year :-

						1959/60	1958/59
Official Samples	...	...	...	...	...	325	285
Other Samples	...	...	...	...	...	71	102
TOTAL						396	387

The increase in official samples is still small while the market is full of many foods and drinks which are not of the quality demanded by purchasers. Some companies have acquired the habit of importing genuine food articles, diluting and selling them, after repacking, at more attractive prices.

The following table gives a summary of the different types of foods examined :

DESCRIPTION										Number of Samples
Alcoholic Drinks	...	...	...	...	...	...	...	...	...	86
Beans	...	...	...	...	...	...	...	...	...	5
Biscuits	...	...	...	...	...	...	...	...	...	9
Cereal Grains	...	...	...	...	...	...	...	...	...	3
Cheese	...	...	...	...	...	...	...	...	...	7
Coffee	...	...	...	...	...	...	...	...	...	2
Dates	...	...	...	...	...	...	...	...	...	3
Flour Wheat	...	...	...	...	...	...	...	...	...	8
Flour Dura	...	...	...	...	...	...	...	...	...	3
Honey and Syrups	...	...	...	...	...	...	...	...	...	11
Jams and Marmalade	...	...	...	...	...	...	...	...	...	2
Milk, Raw	...	...	...	...	...	...	...	...	...	89
Sardines	...	...	...	...	...	...	...	...	...	5
Squashes	...	...	...	...	...	...	...	...	...	4
Sugar	...	...	...	...	...	...	...	...	...	54
Sugar Beet	...	...	...	...	...	...	...	...	...	27
Sweets	...	...	...	...	...	...	...	...	...	4
Tea	...	...	...	...	...	...	...	...	...	4
Tomato Puree and Sauce	...	...	...	...	...	...	...	...	...	64
Other Foods	...	...	...	...	...	...	...	...	...	8
Total										396
RAW MILK :										
Official Samples	...	...	...	...	...	...	...	...	...	88
Other Samples	...	...	...	...	...	...	...	...	...	1
TOTAL										89

Out of the 88 official samples 31 were adulterated with added water. All these samples were from the milk pedlars in the three towns.

The problem of milk adulteration is expected to disappear in the three towns when the milk pasteurisation and bottling plant is established by the Veterinary Service.

Wheat Flour, Dura and Dura Flour

All the samples presented were in regard to infestation with live and dead weevils and acidity. A sample of dura flour showed an acidity of 2.3 per cent as lactic acid.



Generally, after imposing a strict limit for insects in flour, heavily infested wheat flour began to disappear from the market. The change in the quality of wheat flour is astonishing and this proves that the imposition of standards for foods will drastically improve the quality without undue strain on the relevant government machinery.

### *Sugar*

As usual condemned samples were contaminated with sea water or had undergone some inversion. In some cases sugar was condemned for containing dust, plant debris, etc., which is probably due to mixing sugar sweepings with clean sugar.

### *Squashes and Fruit Juices*

Almost all the samples were condemned for being mouldy or containing wild yeast growth. Another feature of most of the samples was the absence of any genuine fruit juice in the drink.

### *Tinned Foods*

Most of these were condemned straight away for being blown, others for leakages and rusting. The position with regard to these has greatly improved since the removal of import restrictions. Most of the commodities of this type in the market were fresh and fit for sale, quite a change from the position last year.

### *Honey and Syrups*

These samples are usually of local produce. The main trouble is their high content of iron which varies between 100 and 800 p.p.m. The higher concentrations are usually found in treacle and molasses. For the latter two a limit of 100 p.p.m. as Fe was adopted as a maximum pending the development of better ways of production.

### *Alcoholic Drinks*

The year has seen the first local products of sherries, wines and spirits. Two companies were offered licences for the production of alcohol and alcoholic drinks.

Both factories produce rectified spirits from grains, dates or molasses. They then ferment imported grape juice and mix it with rectified spirit and water to make sherry containing 23 per cent. v/v alcohol. The alcohol is also mixed with brandy essence and other essences and diluted to make different types of spirits and wines. These products are bottled for the three towns market or sent in barrels to distributors outside the three towns.

This alcoholic drinks industry suffers from many deficiencies.

First of all these products are only artificial mixtures of rectified spirit, water and essences, or in some cases, slightly fermented mother liquor. It is bottled and sold without maturing and hence has the flavour of immature artificial alcohol mixtures. None of the drinks produced at present comes straight from a mother liquor or from distillation of mother liquor.

On the other hand the absence of maturation has led to the deposition of fruit salts in sherry bottles in various shops and these are not allowed to be sold being of a quality not fit for sale. They are usually returned to the factory for refiltering.

Another problem is the bottling of these sherries in various country towns. For example the factory send sherry of 23 per cent. v/v alcohol content in barrels to distributors. The latter usually dilute the sherry with water, sometimes to contain as low as 14 per cent. of alcohol. The diluted sherry is then bottled under most unhygienic conditions. Many of the samples received from places outside the Capital contained insects, dust, plant debris and other foreign materials. On the other hand dilution with different types of water causes wide-spread deposition of salts in bottles.

This system of distribution has two defects. The first, that Customs duties are paid on sherry containing 23 per cent. of alcohol. After dilution the distributors will be selling over one third of their liquor duty free. That is why some resist the suggestion of doing all the bottling in the mother factory.

The second defect is the public health aspect of bottling under unhygienic conditions. The public health authorities can effect strict supervision on processing and bottling only if the activity is centralised in the big factories.

#### **4. Drugs and Pharmaceuticals**

The number of samples presented in this category is nearly the same as that of last year. Almost all the samples presented were of preparations containing dangerous drugs or alcohol sent by the Customs Dept. for checking drug or alcohol content; and from medical and private drug stores for checking specifications. The following samples were some of those received.

1. Samples of Sulphacetamide eye drops and ampoules of Sodium Noramidopyrine methanesulphonate were found to have changed colour probably because of exposure to light.

2. pH values were determined on ampoules of 2 per cent. novocaine solution and on control sample of Gerovital "H3." They were found to have pHs of 5.0 and 3.3 respectively. This was done to verify a method of differentiating between the two in case any cases arose of substituting one preparation for another, during the current craze for "H3" therapy.

3. A sample of Ferro China Bisleri Tonic was found to contain 17.8 per cent. alcohol by volume.

The examination was done in connection with Excise Duties.

4. A sample of Magnesium sulphate was found to be caked and dirty and contaminated with Potassium nitrate (1.4 per cent.). It was condemned as unfit for medical use.

5. Various drugs, preparations, injections and tablets from the Ministry stores and other private drug stores for identity, purity, dosage or fitness for medical use.

6. At the request of a certain drug store a large number of pharmaceuticals which have exceeded their expiry date have been checked and their destruction supervised by a representative of these Laboratories and a certificate issued to this effect.



## *Comment*

This year has seen the first steps being taken towards establishing Pharmaceuticals and Drugs Control. The Central Board of Public Health has appointed a Drug Control Sub-Committee to make recommendations for the control of the pharmaceutical trade in the country. The Sub-Committee met several times and decided on the types of control and recommended that a special section in these Laboratories be established to be called the Pharmaceutical Control Section. The Sub-Committee has also finished amendments to the existing Pharmacy and Poisons Ordinance and the Poisons Regulations to affect the suggested control. The recommendations were passed to the Central Board of Public Health. It is hoped that by the end of 1961 the envisaged control be in force all over the country.

### **5. Clinical Specimens**

Clinical work done in these Laboratories seem to increase markedly one year after another. The number of samples during this year has practically doubled.

As usual most of the samples were of stools for analysis for determining split and unsplit fat. Other samples were of blood or serum for Calcium, Phosphorus or Chlorides ; blood for uric acid or drugs estimations ; ureter or bladder stones for identification ; and other special determinations.

This type of work may be expanded when the new Pharmaceutical Laboratory is established. It is envisaged that such work may be of some value if research in drugs and pharmaceuticals is started.

### **6. Toxicological Specimens**

These include all specimens, mostly in connection with Medico-Legal cases, tested in connection with various poisoning cases. Such specimens are usually sent by the Police, hospitals, public health officers and few from other sources.

#### *A. Human Poisoning*

The following are some of the cases investigated during the year :—

- (i) Two persons died in Abu Gebeiha after taking a plant powder. The powder was found to contain *Datura* alkaloids and was identified as that of *Datura* seeds.
- (ii) Cassava roots were suspected in a case of sudden death at Maridi. The roots were found to contain cyanides.
- (iii) A case of poisoning in Sennar ; *Datura* alkaloids were found in the stomach contents.
- (iv) A case of poisoning at Wad Medani in which camphor was detected in the stomach contents.
- (v) A case of poisoning at Port Sudan was due to ingestion of seconal.
- (vi) A case of poisoning in Khartoum North in which camphor was detected in vomit.
- (vii) A case from Nahud where a woman used some sort of pessary which caused severe inflammation in the genital organs leading to death. The pessary was found to be a piece of meat.



(viii) Urine of a deceased person at Khartoum North was found to contain 276 mg. alcohol per 100 ml.

(ix) Vomit in a case of poisoning was found to contain morpnine as a result of opium ingestion.

### *B. Animal Poisoning*

Many cases of animal poisoning were attributed to ingestion of grasses and grains or plants containing cyanide. Post Mortem specimens from a cow showed Zinc Phosphide which is a common rat poison.

### *C. Plant Materials*

(i) Samples of powdered materials used by a native "doctor" were identified as mixtures of plant materials containing senna and aloes.

(ii) A number of samples submitted were identified as those of powdered Datura seeds.

(iii) Routine identification of opium and hashish was done during the year. The number of these has fallen considerably as compared to previous years.

### *Comment*

Toxicological work during the year has greatly improved in handling and technique. New methods of investigation were introduced and thorough examination was done in most cases. Although this caused some delay in reporting results it ensured conclusive results.

The only problem we still face is the condition in which samples and cases are presented. A memorandum was circulated to all concerned giving a directive for presenting cases. But unfortunately still some cases are received not complying with our directive. We still receive few mls of vomit or stomach content, a small piece of tissue as a P.M. specimen or specimens preserved in formalin. This adds to our difficulties and in many cases makes the results inconclusive or the analysis practically impossible.

Another difficulty is in presenting samples without any case description whatsoever. This usually wastes a lot of time and causes serious delays.

It is hoped that these difficulties will be realised when presenting samples and our directive complied with.

## **7. Other Forensic Specimens**

Other forensic specimens have increased during the year both in number and variety of forensic work done.

(i) A number of documents, money orders, licences, certificates, receipts, etc. were examined for erasures, alterations, counterfeiting and origin.

(ii) Coins and metal sheets used in counterfeits were examined.

(iii) An explosion occurred when a worker heated a metal pipe with a piece of wood at its end. Nitro-cellulose, potassium chlorate and sulphur were identified on the metal pipe and piece of wood.

(iv) A huge fire broke out in a knitwear factory at Khartoum North. The worker in charge said that when he added sodium chlorite to a polythene bucket fire suddenly erupted. After investigating the circumstances of the fire, it was concluded that the fire was caused by the worker adding sodium chlorite to the bucket which contained a residue to oxalic acid which was left from a previous occasion. This was verified by cross-examining the worker who used the bucket on both occasions and by an experiment which reproduced the same fire that started the big fire.

8. Edible Oils, Seeds and Oilcakes

The following samples were submitted for export purposes :—

							No. of Samples	
							1959/60	1958/59
Cottonseed	...	...	...	...	...	...	89	89
Groundnuts	...	...	...	...	...	...	1,569	527
Sesame Seeds	...	...	...	...	...	...	77	107
Safflower Seeds	...	...	...	...	...	...	4	—
Castor Seeds	...	...	...	...	...	...	—	64
Edible Oils	...	...	...	...	...	...	49	23
Oil Cakes	...	...	...	...	...	...	38	112
Dukhn	...	...	...	...	...	...	—	1
Melon Seeds	...	...	...	...	...	...	—	2
Colza Seed	...	...	...	...	...	...	1	—
Rape Seeds	...	...	...	...	...	...	1	—
TOTAL							1,828	925

Hence the number of samples has been nearly doubled. This increase has caused a big strain on the staff who had to cope with it without any extra establishment.

Samples in this section are connected with the World Market for our oilseeds exports. Groundnuts are clearly finding a ready market abroad and this is expected to continue increasing.

9. Damaged Materials

Damaged materials presented for examination in connection with insurance claims totalled 376 compared with 186 samples last year. Here again the number has more than doubled without any increase in staff.

10. Miscellaneous Samples

The following table shows the various types of samples examined in this category :—

									Number of Samples
Building Materials	...	...	...	...	...	...	...	...	4
Insecticides	...	...	...	...	...	...	...	...	32
Essences	...	...	...	...	...	...	...	...	8
Minerals	...	...	...	...	...	...	...	...	40
Paints and Polishes	...	...	...	...	...	...	...	...	2
Soaps	...	...	...	...	...	...	...	...	67
Gums	...	...	...	...	...	...	...	...	31
Tobacco	...	...	...	...	...	...	...	...	4
Methylated Spirits	...	...	...	...	...	...	...	...	4
Textiles	...	...	...	...	...	...	...	...	8
Other samples	...	...	...	...	...	...	...	...	13
TOTAL									213



The examination of most of these was done for various Government Departments to check standards, specifications and quality. Gum analysis was done for export purposes.

The number of samples in this category have also shown about a 36 per cent. increase.

#### *Comment*

In last year's report I commented on the problem of control of import handling and application of pesticides.

The hazard has been realised by the Central Board of Public Health which appointed a Sub-Committee from the Ministries of Agriculture, Health and Animal Resources and the Agricultural Bank to look into the matter. The Sub-Committee drafted a new "Pesticides Regulations" and suggested the formation of a Pesticides Control Board to enforce these Regulations.

### **RESEARCH REPORT**

As expected from the enormous increase in work and the staffing position these Laboratories were unable to do any main research, only the small routine research. A lot of time was spent in streamlining new chemical or physical techniques. Forensic investigations were brought up to date by employing new techniques in toxicology.

The following routine research was continued during the year:—

#### **1. Composition of the Niles at Khartoum**

Regular analysis of monthly samples was continued. Reprints from these are proving more and more of value to industrial concerns. (See Appendix I.)

#### **2. Recovery of Chemicals**

Alcohol recovery from the elections developer solution which was started last year was completed. The distillation apparatus was redesigned to affect partial fractionation of the distilled alcohol. Hence in one process 92 per cent. alcohol was recovered instead of the 80 per cent. which was recovered last year. All the alcohol recovered is being consumed in the routine work of the Laboratories.

The residue left after distillation is being kept till some use is found for the pyrogallol which could be recovered.

#### **3. Nitrates in Potable Waters**

As the Ministry of Animal Resources did not have the time to do their watering experiments on animals, it was decided to pass water containing up to 150 p.p.m. Nitrate Nitrogen to be used for watering animals under observation. Public Health and Local Government Authorities were directed to report any symptoms in animals using such waters.

#### **4. Glossary of Folk Medicines**

In our last Annual Report a Glossary of Folk Medicines of Vegetable Origin was published and that has drawn very wide interest. This year we have compiled from the Graphic Museum and other records Folk Medicines of Mineral Origin (See Appendix II.)



## REPORTS AND PUBLICATIONS

The following publications were published during the year :—

1. Annual Report of The Government Analyst—1958/59.
2. “ The Wellcome Laboratories.”

This was a written contribution by the Government Analyst, and was published in the Proceedings of the Philosophical Society of the Sudan, 1960.

The contribution was also serially published in “ *Sudan Daily*.”

APPENDIX I  
COMPOSITION  
OF  
MONTHLY WATER SAMPLES  
taken from  
KHARTOUM MAINS SUPPLY  
BLUE NILE  
WHITE NILE  
WELLCOME CHEMICAL LABORATORIES

## APPENDIX I

### TABLE I — COMPOSITION OF KHARTOUM MAIN SUPPLY

# Blue Nile Water Treated with Alum, Filtered and Treated by Marginal Chlorination)

Date	...	...	...	5.7.59	1.8.59	3.9.59	3.10.59	4.11.59	3.12.59	2.1.60	1.2.60	5.3.60	2.4.60	1.5.60	2.6.60
pH	...	...	...	8.2	8.0	7.1	7.3	7.1	8.1	8.1	8.2	8.3	8.3	8.2	8.3
Dionic Reading	...	...	...	200	210	230	150	140	140	175	175	170	200	200	200
Total Solids	...	...	P.P.M.	140	200	180	136	120	90	160	120	110	150	140	150
Total Hardness (CaCo <sub>3</sub> )	..	..	..	90	126	122	92	92	84	98	104	104	140	126	118
Total Alkalinity (CaCo <sub>3</sub> )	..	..	..	90	60	80	90	80	85	100	110	100	120	130	120
Calcium (Ca)	...	...	..	23	30	35	24	24	22	24	26	15	33	30	30
Magnesium (Mg.)	...	...	..	8	12	8	8	8	7	9	10	16	14	12	11
Silicate (SiO <sub>2</sub> )	...	...	..	15	15	10	10	15	10	10	8	10	15	10	10
Sulphate (SO <sub>4</sub> )	...	...	..	19	29	19	10	10	10	10	10	10	14	10	14
Chloride (Cl)	...	...	..	6	6	6	4	6	6	4	6	4	6	5	8
Nitrate (N)	...	...	..	1.0	1.0	1.0	0.8	1.0	0.8	1.3	1.3	1.3	1.0	0.8	1.0
Ammoniacal Nitrogen (N)	..	..	..	0.06	0.08	0.04	0.02	0.06	0.06	0.08	0.06	0.04	0.04	0.06	0.04
Albuminoid Nitrogen (N)	..	..	..	0.06	0.30	Nil	Nil	0.02	0.20	0.20	0.20	0.10	0.34	0.06	Nil



TABLE COMPOSITION OF BLUE NILE WATER AT KHARTOUM

Date	...	...	...	...	5.7.59	1.8.59	3.9.59	3.10.59	4.11.59	3.12.59	2.1.60	1.2.60	5.3.60	2.4.60	1.5.60	2.6.60
Water Temperature °C.	...	...	...	...	27	27	26	27	27	22	19	19	22	27	27	30
pH	...	...	...	...	8.2	8.3	8.3	8.1	8.2	8.2	8.3	8.3	8.7	8.4	8.4	8.5
Dionic Reading	...	...	...	...	150	150	140	130	120	130	140	145	155	180	200	200
Total Dissolved Solids ... p.p.m.	...	...	...	...	140	240	95	135	140	95	130	110	140	140	150	130
Total Hardness (CaCo3 )...	...	...	...	...	74	94	86	72	76	86	88	90	106	118	112	112
Total Alkalinity (CaCo3 )	...	...	...	...	80	90	90	90	90	90	80	100	110	120	140	130
Ca	...	...	...	...	20	23	22	21	10	20	21	22	25	43	28	29
Magnesium (Mg)	...	...	...	...	6	8	7	5	12	9	9	8	11	2	10	10
Silicate (SiO2 )	...	...	...	...	15	15	10	10	15	10	10	8	10	15	10	10
Sulphate (SO4 )	...	...	...	...	14	10	14	10	10	10	10	10	10	10	10	10
Chloride (Cl)	...	...	...	...	6	6	4	6	6	4	4	4	6	6	8	10
Nitrate (N)	...	...	...	...	1.0	1.2	1.0	0.8	1.0	0.9	1.3	1.3	1.3	0.8	0.8	1.0
Ammonioal Nitrogen (N)	...	...	...	...	0.06	0.04	0.04	0.04	0.04	0.04	0.14	0.06	0.06	0.06	0.04	0.04
Albuminoid Nitrogen (N)	...	...	...	...	0.10	0.30	0.24	Nil	0.04	0.30	0.30	0.10	0.4	0.32	0.08	0.12
Dissolved Oxygen	...	...	...	...	4.8	3.9	4.5	6.1	6.7	5.9	8.5	8.4	9.6	7.5	7.4	8.0
Biochemical Oxygen Demand	...	...	...	...	2.1	1.4	1.7	2.4	0.9	0.1	1.6	1.4	5.5	1.1	2.8	4.0

APPENDIX I

TABLE COMPOSITION OF WHITE NILE WATER AT KHARTOUM

Date	...	...	...	5.7.59	1.8.59	3.9.59	3.10.59	4.11.59	3.12.59	2.1.60	1.2.60	5.3.60	2.4.60	1.5.60	2.6.60
Water Temperature °C ...	...	...	...	26	29	30	27	26	20	16	18	22	26	27	29
pH. ...	...	...	...	8.4	8.2	8.3	8.1	8.6	8.4	8.6	8.6	8.5	8.3	8.3	8.3
Dionic Reading ...	...	...	...	175	170	190	150	140	135	140	130	140	180	200	200
Total Dissolved Solids ... p.p.m.	...	...	...	200	240	165	125	130	95	120	100	110	140	150	140
Total Hardness (CaO <sub>3</sub> ) ...	...	...	...	60	78	60	54	68	76	58	62	60	82	66	64
Total Alkalinity (CaCO <sub>3</sub> ) ...	...	...	...	110	110	110	100	90	90	90	90	110	120	140	130
Calcium (Ca) ...	...	...	...	11	15	14	11	18	11	12	10	14	13	13	10
Magnesium (Mg) ...	...	...	...	8	10	6	6	5	12	7	9	6	12	8	10
Silicate (SiO <sub>2</sub> ) ...	...	...	...	15	15	10	5	5	10	5	8	10	15	5	10
Sulphate (SO <sub>4</sub> ) ...	...	...	...	14	10	14	10	10	10	10	10	10	10	10	10
Chloride (Cl) ...	...	...	...	12	10	14	12	10	2	6	6	6	10	12	12
Nitrate (N) ...	...	...	...	0.8	1.0	1.0	0.8	1.0	0.9	1.3	1.3	1.3	0.8	0.8	1.0
Ammoniacal Nitrogen (N) ...	...	...	...	0.06	0.06	0.34	0.12	0.08	0.06	0.06	0.06	0.06	0.10	0.08	0.04
Albuminoid Nitrogen (N) ...	...	...	...	0.30	0.30	0.46	0.48	0.40	0.34	0.60	0.40	0.40	0.16	0.14	0.14
Dissolved Oxygen ...	...	...	...	4.8	4.6	5.2	6.9	7.2	8.0	8.7	8.7	8.1	6.6	6.6	6.6
Biochemical Oxygen Demand ...	...	...	...	1.3	2.0	2.9	3.1	6.0	6.0	5.1	5.4	5.8	4.0	5.1	4.7

APPENDIX II  
SUDAN  
FOLK MEDICINE AND MATERIA  
MEDICA  
CATALOGUE OF MINERAL SAMPLES WITH NOTES  
ON USES  
WELLCOME CHEMICAL LABORATORIES  
MINERAL



# MINERAL

No.	ORIGIN		NATURE	ENGLISH	ARABIC
M1	Europe India	Khartoum El Obeid	Black Metal	Kohl	Kohl
M2	Egypt India	El Obeid El Obeid	Metal with Powder	Mercury Zinc	Zebaq
M3	India	Omdurman	Metal with Powder	Zinc Sulphate	Tutia Beida
M4	Egypt	Omdurman	Green	Copper Sulphate	Tutia Khadra
M5		Kosti	Green Powder	Copper Sulphate	Tutia Khadra
M6	Egypt	El Obeid	White Crystal	Alum	Shabb
M7		Kosti	Yellow Powder	Tureiba Earth	Tureiba
M8	Local	Khartoum	An Earth	Tureiba Earth	Tureiba
M9	Local	Khartoum	An Earth	Jardiga Salt	Jardiga Jardika
M10	J. Medab Darfur	Soderi	An Earth	Jardiga Salt	Jardika
M11	Local	Khartoum	An Earth	Gaab Salt	Milh Gaab
M12	Dongola Desert	Soderi	An Earth	G'a Salt	Milh El G'a
M13	Local	Khartoum	Powdery Rock	Natron	Atrun

# MINERAL

No.	IDENTITY	NOTES
M 1	Metallic Antimony ... ..	Powdered and applied to the eyelids — as a cosmetic and also as a prophylatic or remedy for eye diseases.
M 2	Mercury ... ..	Used by FOGARA to make an ink from it for writing. Mixed with perfume rubbed in women's hair to destroy lice. Mixed with sand and placed on grain to keep pests away.
M 3	Zinc Sulphate ... ..	Used as local application in eye diseases. Mixed with water and rubbed round the eyes to relieve pain.
M 4	Copper Sulphate ... ..	In Talodi it is used as an application to the tertiary skin lesions of syphilis.
M 5	Copper Sulphate ... ..	Found in equipment of FAKI practitioner.
M 6	Alum ... ..	Used for clearing dirty water. Used in FOGARA medicine in fumigation against the Evil Eye. Bought mostly by iron workers and Fellata.
M 7	Lead Chromate ... ..	Found in equipment of FAKI practitioner.
M 8		For syphilis and chronic tropical ulcers.
M 9	Common Salt and Carbonate of Soda ... ..	Diseases of alimentary system.
M10	Sod. Carbonate ... .. 32.6% Sod. Bicarbonate ... .. 25.0% Sod. Chloride ... .. 5.1% Iron Oxide ... .. 3.1% Calc. Carbonate ... .. 4.9% Mixture of Carbonates.	The Kababish and Kawahla give it with water to their cattle because "it makes them fat." For humans it is taken for "WAJA GALB" at all seasons. In summer a solution of it is applied to DABBAS. Dug out of shallow lake in a volcano crater called MALHA. People dive and bring up handfuls and put it on log rafts which is then taken ashore, dried and transported by camel.
M11		Swellings of rheumatic nature.
M12	Impure common salt containing considerable potassium (Calculated as sodium) ... .. Sod. Carbonate ... .. 4.1% Sod. Bicarbonate ... .. 3.5% Sod. Chloride ... .. 58.5% Sod. Sulphate ... .. 5.5% Calc. Carbonate ... .. 9.3%	Used mostly by Hawawr and Kababish. It is used in the MULAH. As a solution it is drunk for splenomegaly.
M13	Sod. Carbonate ... .. 40.6% Sod. Bicarbonate ... .. 29.3% Mixture of Sod. Carbonate and Bicarbonate.	Aperient, Fevers

# MINERAL

No.	ORIGIN		NATURE	ENGLISH	ARABIC
M14	Dongola	Bir Natrun	Powdery Rock	Natrun	Atrun
M15	Dongola	Bore Natrun Soderi	Powdery Rock	Natrun	Milh Atrun
M16	Um Gawasir Dongola	Soderi	Reddish Powdery Rock	Red Salt	Milh Aheimar
M17	El Ghar Shrshar near Soderi	Soderi	White Crystalline	Sharshar Salt	Milh Sharshar
M18	Dar Nuba Jebal Otoro	J. Otoro	Stratified Crystal Concentrate		Nuba Kartilla
M19	J. Urnu Otoro Dar Nubu	J. Urnu Otoro	Friable Rock	Talcose Serpentine (a decomposed granite)	Gir
M20	J. Urnu Otoro Dar Nuba	J. Urnu Otoro	Red Friable Lumps	Red Ochre	Maghar Ahmar
M21	J. Kan. Dar Nuba	J. Kan	Yellowish Red Friable Lumps	Red Ochre	Maghar Ahmar
M22	J. Kan. Dar Nuba	J. Kan.	Ditto	Red Ochre	Goruge Nyera
M23	J. Kan. Dar Nuba	J. Kan.	Ditto	Green Ochre	Mahgr Akhdar
M24	D. Nuba F. Fungor Sheek Ablu	J. Fungor	Dark Red Rock	Haematite	Kada Gabongre
M25	Sheek Abu Ali	Soderi	Dark Red Rock	Ditto	Maghr



# MINERAL

No.	IDENTITY	NOTES
M14	Sod. Carbonate ... 40.6% Sod. Bicarbonate ... 29.3% Mixture of Sod. Carbonate and and Bicarbonate.	All Local (Sodari) people give it to their camels and horses. Humans take it for dyspepsia (ABU SHEGAG). Take 5 rotls SEMN and 2 of ATRUN. Mix. Eat $\frac{1}{4}$ rotl at dawn for 20 days.
M15	Sand and Clay ... 72.1% Sod. Chloride ... 22.8% Iron Oxide ... 1.0% Calc. Carbonate... 3.0% A Salty Sand.	Used as a food salt for cattle and humans. No medicinal value. All tribes use it.
M16	Sand and Clay ... 66.9% Sod. Chloride ... 25.1% Iron Oxide ... 2.3% Calc. Carbonate ... 1.8% Salty Soil Containing Iron.	Used mainly by the Kabebish and Hawawir as a food salt for themselves and their cattle. Has no medicinal value.
M17	Sand and Clay ... 1.2% Sod. Chloride ... 62.4% Sod. Sulphate ... 36.8%	Used mainly by people of DAR HAMID as a food salt for themselves. They put it in the drinking water of their cattle.
M18	Sand and Clay ... 1.65% Sod. Carbonate ... 41.1% Sod. Bicarbonate ... 6.1% Sod. Sulphate ... 43.4% Iron Oxide ... 0.45% Same Potassium Calculated as Sodium.	
M19	Talcose Serpentine ... ..	Crushed in water, is used for anointing the bodies of the adolescents at ceremony of "Cut- ting the Gir" among local Nubas.
M20	Sand and Clay ... 60.6% Iron Oxide ... 20.4% a Ferruginous Sand.	Crushed, mixed with sesame oil and used for anointing the body ritually and as a routine.
M21	Sand and Clay ... 78.2% Iron Oxide ... 9.9% a Ferruginous Sand.	- Ditto -
M22	Sand and Clay ... 60.7% Iron Oxide ... 27.6%	Contains more iron than M21 Used as in foregoing for males only
M23	Sand and Clay ... 78.6% Sod. Chloride ... Trace Iron Oxide ... 10.0%	Used as in foregoing by either sex. Said to give the green effect.
M24	Sand and Clay ... 11.8% Iron Oxide ... 84.5%	Used as in foregoing for males only. Said to be a green moghr.
M25	Sand and Clay ... 11.8% Iron Oxide ... 84.5%	Picked up amongst derelict houses on top of Jebal. Considered evidence of ochore-using former inhabitants.

# MINERAL

No.	ORIGIN		NATURE	ENGLISH	ARABIC
M26	Sennar	Sennar	Amourphous mass	Potash Salt	Kumbo
M27		Omdurman	Crystal Salt	Sudan Salt	Milh Ta'ma
M28	Belgium	Sennar	Indidixent	Rosaniline	Tifta Hamra
M29	Dongola	Attiri	Amourphous	—	Atrun Binnu

# MINERAL

No.	IDENTITY	NOTES
M26	Pot. Chloride ... 33.5% Pot. Carbonate ... 15.48% Pot. Bicarbonate ... 12.40% Pot. Phosphate ... 5.65% Pot. Silicate ... 6.91% Pot. Chloride ... 2.66% Iron Oxide ... 0.14% Alumina ... 0.04% Calc. Sulphate ... 0.14% Mag. Sulphate ... 0.04%	Made from filtered ashes of burnt gassab.
M27	Sodium Chloride ...	Crude market salt-presumably from Port Sudan.
M28	A Triphenyl-methane Dye	Used as a local instillation for conjunctivitis.
M29	An Alkaline Earth ...	Used in cooking vegetables and in chewing. Boil; strain off water on to dates; boil together, drink for fever.



# APPENDIX "C."

## LIST OF PUBLICATIONS DURING THE YEAR BY MEMBERS OF THE STAFF

Name and Itials of Author	Date of Publication	Title of Article	Title of Journal in which Published	Volume Number of Journal	Page Number of Journal
Abdel Hamid Ibrahim ...	June, 1960.	Annual Report of The Government Analyst 1958/59	Booklet		
Abdel Hamid Ibrahim ...	January, 1960	The Wellcome Laboratories	Proceedings of The Philosopical Society of the Sudan.		

## CHAPTER IX

### SCHOOL OF HYGIENE

#### School Facilities

The School occupies its own buildings which has the great advantage of being next door to the Graphic Health Museum. The Graphic Health Museum, which is also directly supervised by the Principal of the School of Hygiene and which is extensively used by the students, provides very useful material for demonstrations and other visual studies.

#### Staff

- (1) Principal.
- (2) Assistant Principal.
- (3) Public Health Officer.
- (4) Clerk.

#### Board of Studies

The Board of Studies in association with the School, which consist of the A/Director (Public Health) as Chairman, Principal, School of Hygiene as Secretary, Chief Public Health Inspector and Assistant Principal, School of Hygiene as members, has held four meetings during the year to discuss the different aspects of the School policy.

#### Basis for Education for School

The basis of education on which training is required is that of the 4th year secondary standard.

#### Asst. Sanitary Overseers

They are Local Government officials and their training is made up of a curriculum prepared by the Principal, School of Hygiene. Their training outside is undertaken by the local Senior Public Health Inspectors and those in Khartoum Province receive an organised course of training in the School of Hygiene.

#### Sanitary Overseers

These are Ministry of Health officials and candidates are drawn from the A/Sanitary Overseers category by examination.

On selection the candidates receive a six month training in the School of Hygiene, which includes an adequate number of demonstrations to supplement lectures.

#### Public Health Officer Students

The basic education now required is that of the Secondary standard. Candidates for the School are required to be from those who have completed their secondary education and the selection is made by an interview.

The students take a 3 years' course at the end of which they must pass the R.S.H. examination before being awarded the qualifying certificate.



**The Curriculum is briefly as follows :—**

*1st Year*

General Science, Building Science, Drawing and Construction, Levelling and Geometry. Given at Khartoum Technical Institute.

*2nd Year*

Entomology and Pest Control, Helminthology, Protozoology and Bacteriology, Water Supply and Disposal of Waste Matter.

*3rd Year*

Food and Food Control, Meat Inspection, Milk, Food Production and Manufacture, Housing, Urban and Rural Planning, Communicable Diseases, School Health, Prison Health, Quarantines, Airports and Seaports, Central Statistics, Sanitary Law, Relations between Councils and Public Health Staff, notes on training within industries.

The necessary demonstrations that supplement the lectures include visits to Water Works, Food Production Places, Schools, Prison Manufactures and Factories of Public Health interest and certain councils meetings.

**SCHOOL REPORT FOR THE PERIOD  
1st JULY, 1959 — 30th JULY, 1960**

During the year 15 students were under training in the final class, 3 of them from Aden Municipality.

They took the R.S.H. examination on 30th April, 2nd, 4th and 8th May, 1960.

The examination which was held in Khartoum, was conducted by Dr. Abdalla Omer Abu Shamma, Dr. Mansour Ali Hasseeb, Sayed Abdel Rahman El Agib and Sayed Khalafalla Babiker with the Principal, School of Hygiene in attendance.

Of the 15 entrants 9 passed the examination. The unsuccessful entrants were 6 students who have been referred for a period of 3 months to be examined on 10th, 11th, 12th and 14th September, 1960.

**1st and 2nd Years**

No intake two years ago.

**Practical Training**

(1) The daily practical training is being carried out in Khartoum city and its rural area. 2nd and 3rd class students have specific districts for their daily practical training hours and on Thursdays they do full time inspection and report on insanitary premises and other food preparation places, Water and milk samples from Khartoum Province are handled by the students.

(2) Annually, during the school vacation between April and August, the Students, after being granted their leaves, are posted to different provinces to work under qualified Public Health staff.

(3) Different municipal and rural councils' meetings are attended by the students as part of training.

Rural areas for mosquito work are also visited by the students.

**General**

Medical Assistant, Health Visitors and Khartoum Nursing College Students have received separate courses in Public Health.

Local Government Executive Officers have also received lectures in Public Health.

The Principal, School of Hygiene was sent on duty to Wadi Halfa for the resettlement organisation purposes.



## CHAPTER X

### THE GRAPHIC MUSEUM

No change of staff had taken place during the year.

As usual, revision, keeping up to date, and translation of exhibited material together with the routine maintenance of the whole place was carried out satisfactorily. Extensive programme of work on outside exhibitions was carried out. Also, photographs were given to Doctors preparing for D.P.H.

The museum had contributed on the anniversary of the 17th November, 1959 by erecting the pavillion for the Ministry of Health, which had attained a remarkable standard.

The recorded visits to the museum by the general public during the year were 17,134.

The teaching facilities which the museum affords were taken advantage of by the students of the Senior Class of Medical Students, Students of the School of Hygiene, Medical Assistants, Health Visitors, Midwives and junior hospital staff. More use was made of the museum by the pupils of secondary schools and elementary schools by both boys and girls.

#### Permanent Exhibitions

The following materials was added during the year :—

Photographs	..	..	..	..	..	..	100
Charts and Graphs	..	..	..	..	..	..	2
Drawings	..	..	..	..	..	..	10
Descriptive Notes	..	..	..	..	..	..	150
Models	..	..	..	..	..	..	—
Specimens..	..	..	..	..	..	..	—
Posters	..	..	..	..	..	..	—

The exhibition now comprises :—

Photographs	..	..	..	..	..	..	2,481
Charts and Graphs	..	..	..	..	..	..	242
Drawings	..	..	..	..	..	..	296
Posters	..	..	..	..	..	..	17
Descriptive Notes	..	..	..	..	..	..	2,308
Specimens..	..	..	..	..	..	..	676
Models	..	..	..	..	..	..	200

It is a pleasure to report that the following distinguished persons visited the museum this year :—

Dr. Ahmed El Sawi	..	..	UNICEF, Cairo.
Dr. Julia M. Anderson	..	..	American University, Beirut
Dr. Dimitry Chtienbiety	..	..	Academy of Sciences of U.S.S.R., Moscow
Dr. M. Yarsovley	..	..	
Dr. M. A. Faghih	..	..	Tehran School of Medicine.

Sections of the museum are :—

- |                               |                                 |
|-------------------------------|---------------------------------|
| 1. Malaria                    | 29. Typhus                      |
| 2. Trypanosomiasis            | 30. Quarantine Arrangements     |
| 3. Leishmaniasis              | 31. Phlebotomus Fever           |
| 4. Syphilis                   | 32. Disinfection Methods        |
| 5. Yaws                       | 33. Meteorology                 |
| 6. Relapsing Fever            | 34. Water Supply                |
| 7. Filariasis                 | 35. Influenza                   |
| 8. Diphtheria                 | 36. Pneumonia                   |
| 9. Ancylostomiasis            | 37. Dysentery                   |
| 10. Schistosomiasis           | 38. Enteric Fever               |
| 11. Madura Disease            | 39. Maternity and Child Welfare |
| 12. Nutrition                 | 40. School Medical Service      |
| 13. Gonorrhoea                | 41. Town Planning               |
| 14. Cholera                   | 42. Housing                     |
| 15. Tetanus                   | 43. Undulant Fever              |
| 16. Tuberculosis              | 44. Eye Diseases                |
| 17. Anthrax                   | 45. Medical Entomology          |
| 18. Cerebro-Spinal-Meningitis | 46. Skin Diseases               |
| 19. Plague                    | 47. Disposal of Waste Matter    |
| 20. Rabies                    | 48. Folk Medicine               |
| 21. Leprosy                   | 49. Propaganda                  |
| 22. Measles                   | 50. Rural Health                |
| 23. Mumps                     | 51. Hydatid Disease             |
| 24. Yellow Fever              | 52. Venomous Snakes             |
| 25. Smallpox                  | 53. Historical Medicine         |
| 26. Chickenpox                | 54. Tumours                     |
| 27. Vaccinia                  |                                 |
| 28. Dengue                    |                                 |



TABLE I — 1959/60

OUT-PATIENTS

NEW CASES BY DISEASES AND TOTAL ATTENDANCES

DISEASE	B. EL CHAZAL	BLUE NILE	DARFUR	EQUATORIA	KASSALA	KHARTOUM	KORDOFAN	NORTHERN	UPPER NILE	TOTAL
1. Cholera ...	—	—	—	—	—	—	—	—	—	—
2. Plague ...	—	—	—	—	—	—	—	—	—	—
3. Small Pox ...	—	241	20	1	65	3	2	—	—	336
4. Typhus ...	—	—	—	—	—	—	—	—	—	—
5. Yellow Fever ...	—	114	—	—	—	—	—	—	—	—
6. T.B. Pulmonary	485	1,042	217	331	1,004	1,614	477	654	6	120
7. T.B. Non-Pulmonary	—	—	—	—	—	—	—	—	1,238	7,062
8. Pneumonia ...	175	914	74	96	1,425	562	348	290	962	4,846
9. Influenza ...	825	23,349	3,483	7,838	5,156	17,065	12,407	12,958	5,439	88,520
10. Other Respiratory Diseases	1,754	5,588	397	34,885	63,468	13,282	8,839	14,275	3,635	146,123
11. Cerebro-Spinal Meningitis	36,228	666,433	109,251	185,317	239,565	359,218	277,922	263,102	64,672	2,201,708
12. Chicken Pox	147	137	6	562	28	376	49	37	117	1,459
13. Diphtheria	474	4,554	716	2,211	1,544	5,011	3,025	2,179	1,333	21,047
14. Encephalitis	2	117	9	20	137	488	88	57	22	940
15. Measles ...	—	—	—	6	—	—	—	—	2	8
16. Mumps ...	1,311	10,697	156	2,802	4,333	10,828	2,420	12,583	1,230	46,360
17. Poliomyelitis, Acute	245	6,178	41	1,859	1,174	6,149	2,945	3,150	613	22,354
18. Rheumatism, Acute	1	107	3	25	2	113	30	41	6	328
19. Whooping Cough	3,397	5,315	1,659	955	1,146	6,113	5,706	4,701	1,679	30,671
20. Dysentery	60	3,617	4,817	1,345	2,250	2,794	3,185	5,819	954	24,841
21. Enteric Fever	5,594	37,337	17,732	14,098	6,367	32,126	17,035	39,877	12,795	182,961
22. Gastro-Enteritis of Children	1	239	1	12	58	251	20	171	10	763
23. Undulant Fever	453	52,270	4,626	1,895	4,919	43,293	14,599	23,898	9,833	155,786
24. Filariasis	—	25	—	3	—	6	3	—	1	41
25. Leishmaniasis	113	2	—	1,107	1	4	1	—	53	1,281
26. Malaria	—	1,590	7	105	—	—	—	—	—	—
27. Blackwater Fever	16,916	74,150	41,390	103,667	317	36	50	4	1,908	4,017
28. Onchocerciasis	2,405	1	—	376	74,634	20,257	189,548	16,346	29,226	566,134
29. Phlebotomus Fever	—	—	—	—	—	—	—	—	—	2
30. Relapsing Fever	—	—	6	—	36	2	—	—	—	2,786
31. Trypanosomiasis	—	—	—	—	—	—	—	—	—	38
32. Ancylostomiasis	1,748	81	—	262	—	—	—	—	—	6
33. Dracontiasis	882	108	2,613	7,830	5	28	23	72	187	262
34. Schistosomiasis	965	17,446	—	1,335	34	105	543	—	521	12,587
35. Gonorrhoea	4,264	6,293	3,412	4,065	119	4,566	11,020	5,636	114	3,528
36. Soft Sore	41	625	1,594	9,628	6,173	8,440	13,662	1,801	6,252	47,345
37. Syphilis...	4,373	8,539	26,490	151	297	222	391	9	174	77,422
38. Yaws	8,936	—	21	12,283	10,118	11,205	28,258	3,958	22,154	3,504
39. Anthrax	—	—	—	19,873	—	—	4	—	16,321	127,378
40. Hydrophobia, Human	—	—	—	—	91	2	65	—	9	45,155
41. Leprosy ...	—	5	1	2	—	2	10	1	—	167
42. Madura Disease	155	162	114	522	10	73	47	33	147	21
43. Tetanus ...	17	505	—	3	15	1,173	61	55	—	1,263
44. Heat Stroke	—	75	5	25	4	12	31	18	—	1,813
45. Syndrome	2	—	32	—	14	1	1	—	—	292
46. Confinements	254	2,167	255	770	420	3,344	1,438	329	147	50
47. Gynaecological ...	499	23,759	7,585	1,882	6,544	17,079	14,291	10,138	1,272	9,124
48. Diseases of Pregnancy and Parturition	135	2,240	1,074	737	220	8,978	6,226	1,628	36	83,049
49. Puerperal Fever	3	113	9	16	9	36	81	121	11	21,274
50. Wounds and Injuries	56,142	509,284	369,840	250,182	186,501	298,383	254,999	189,409	84,653	2,199,393
51. Tropical Ulcer	6,056	2,014	3,659	13,969	1,111	68	5,102	5	5,168	2,199,393
52. Diabetes	30	437	381	123	538	2,344	450	1,471	98	37,152
53. Pellagra	—	4	—	—	—	2	—	—	87	5,872
54. Scurvy	42	883	57	33	623	61	1,735	4	138	93
55. Neoplasms, Malignant	7	154	118	25	28	143	136	50	9	3,576
56. Neoplasms, Non-Malignant	27	2,035	95	126	509	1,619	1,085	284	178	670
57. Trachoma	17	63,371	10,051	1,268	8,201	50,111	32,420	87,015	6,790	5,958
58. All Other Eye Diseases	23,403	518,276	78,608	74,384	110,795	272,699	150,350	189,551	64,468	259,244
59. Ear Diseases	8,404	86,669	19,114	20,669	26,875	60,216	34,898	47,409	13,346	1,482,534
60. Skin Diseases	17,886	51,402	23,930	44,380	19,199	33,442	91,326	24,960	16,708	317,600
61. Alimentary Diseases	35,971	783,046	146,559	171,487	204,038	327,227	281,467	288,619	56,469	323,233
62. Circulatory Diseases	539	64,251	5,413	849	20,562	30,795	21,443	33,729	3,718	2,294,883
63. Genito-Urinary Diseases	2,069	93,968	23,829	4,506	18,293	82,828	35,441	54,381	6,375	181,299
64. Organic Nervous Diseases	19	7,165	8,379	43	445	2,631	4,753	9,584	593	321,690
65. Functional Nervous Diseases	15	370	60	50	12	61	921	2,027	8	33,612
66. Fever of Uncertain Origin	26,971	23,409	8,143	53,778	13,370	106,070	3,374	37,941	41,839	3,524
67. All Other Conditions	43,749	488,914	62,285	184,670	110,990	189,662	192,115	81,177	77,816	314,895
Poisoning	—	71	—	—	183	3	2	1,376	—	1,431,288
Total new cases	314,208	3,651,860	1,009,246	1,239,443	1,153,871	2,033,227	1,726,868	1,472,940	561,645	13,163,322
ATTENDANCES :										
MEN	335,604	1,237,084	741,863	1,027,526	624,961	1,293,671	1,127,947	827,214	289,215	7,505,085
WOMEN	228,451	1,379,384	573,072	558,029	435,044	1,250,552	1,038,154	1,087,992	248,482	6,799,160
CHILDREN	261,154	1,836,251	855,489	610,972	674,640	1,468,256	1,506,043	1,828,388	336,334	9,377,527
Total Attendances	825,209	4,452,719	2,170,424	2,196,527	1,734,645	4,012,479	3,672,144	3,743,594	874,031	23,681,772
MISSIONS	—	—	—	—	—	70,187	82,829	—	164,468	317,484
Grand Total	825,209	4,452,719	2,170,424	2,196,527	1,734,645	4,082,666	3,754,973	3,743,594	1,038,499	23,999,256







TABLE II  
ADMISSIONS AND DEATHS BY DISEASES

DISEASE	BAHR EL GHAZAL		BLUE NILE		DARFUR		EQUATORIA		KASSALA		KHARTOUM		KORDOFAN		NORTHERN		UPPER NILE		TOTAL		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	
1. Cholera ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
2. Plague ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
3. Small Pox ...	—	—	205	3	20	2	1	—	65	4	1	—	2	—	4	—	—	—	298	9	3
4. Typhus ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4
5. Yellow Fever ...	—	—	114	88	—	—	—	—	—	—	—	—	—	—	—	—	6	—	120	88	5
6. T.B. Pulmonary ...	301	21	866	53	204	8	275	14	541	38	1,161	52	434	65	299	13	182	19	4,263	283	6
7. T.B. Non-Pulmonary ...	47	3	275	9	73	6	64	1	116	1	271	12	158	3	66	4	227	4	1,297	43	7
8. Pneumonia ...	498	29	1,486	85	498	22	2,018	103	545	37	1,419	91	2,048	149	566	31	764	14	9,842	561	8
9. Influenza ...	39	2	83	2	347	6	3,074	61	185	—	234	4	288	—	109	—	1,883	—	6,242	75	9
10. Other Respiratory Diseases	255	7	822	49	218	15	568	16	1,113	6	740	11	1,374	56	1,146	6	387	9	6,623	175	10
11. Cerebro-spinal Meningitis ...	147	24	93	25	6	1	555	66	28	6	372	29	49	19	37	6	38	5	1,325	181	11
12. Chicken Pox ...	185	—	241	2	530	2	613	1	221	6	78	—	548	—	41	—	265	—	2,722	11	12
13. Diphtheria ...	2	1	107	18	7	2	17	3	105	18	379	21	88	18	57	8	22	2	784	91	13
14. Encephalitis Lethargica ...	—	—	—	—	—	—	6	6	—	—	—	—	—	—	—	—	1	—	7	6	14
15. Measles ...	67	—	323	4	156	13	374	1	230	5	266	2	342	3	147	—	217	—	2,122	28	15
16. Mumps ...	62	—	115	1	41	—	161	—	90	1	50	1	199	—	42	—	57	—	817	3	16
17. Poliomyelitis, Acute ...	1	—	104	5	3	—	13	1	—	—	119	10	29	8	37	6	6	—	312	30	17
18. Rheumatism, Acute ...	122	—	298	2	25	—	67	2	19	—	98	1	218	—	153	1	135	—	1,135	6	18
19. Whooping Cough ...	9	2	71	1	422	—	50	8	17	3	158	4	97	—	72	—	60	2	956	20	19
20. Dysentery ...	381	22	584	29	694	13	774	44	321	8	597	17	515	10	433	4	702	30	5,001	177	20
21. Enteric Fever ...	1	1	238	17	1	—	12	—	51	7	174	5	20	3	171	2	10	—	678	35	21
22. Gastro-enteritis of Children	19	2	1,556	150	952	21	118	15	436	57	997	118	536	51	765	70	186	17	5,565	501	22
23. Undulant Fever ...	—	—	25	1	—	—	3	—	1	1	7	—	3	1	3	—	1	—	43	3	23
24. Filariasis ...	4	—	2	—	—	—	42	—	—	—	4	—	1	—	—	—	4	—	57	—	24
25. Leishmaniasis ...	—	—	808	61	7	2	88	4	286	27	40	4	50	2	4	1	1,042	29	2,325	130	25
26. Malaria ...	622	36	1,828	25	676	23	2,488	77	1,412	37	273	10	2,679	74	229	3	933	29	11,140	314	26
27. Blackwater Fever ...	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	27
28. Onchocerciasis ...	58	—	1	—	—	—	5	—	—	—	2	—	—	—	—	—	—	—	66	—	28
29. Phelbotomus Fever...	—	—	—	—	—	—	—	—	36	—	2	—	—	—	—	—	—	—	38	—	29
30. Relapsing Fever ...	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	30
31. Trypanosomiasis ...	—	—	—	—	—	—	262	5	—	—	—	—	—	—	—	—	—	—	262	5	31
32. Ancylostomiasis ...	301	12	15	—	136	—	550	10	3	—	7	—	12	1	29	1	24	—	1,077	24	32
33. Dracontiasis ...	79	1	35	—	—	—	105	—	5	—	32	—	34	—	—	—	116	—	433	1	33
34. Schistosomiasis ...	74	4	539	9	380	—	345	8	43	—	140	2	132	2	81	1	12	—	1,746	26	34
35. Gonorrhoea ...	71	1	34	6	191	—	334	—	41	1	9	—	114	—	4	—	98	—	896	8	35
36. Soft Sore ...	2	—	—	—	34	—	14	—	3	—	9	—	19	—	—	—	10	—	91	—	36
37. Syphilis ...	146	—	56	—	476	—	491	3	88	1	29	3	525	2	73	1	397	—	2,281	10	37
38. Yaws ...	68	1	—	—	—	—	478	—	—	—	—	—	3	—	—	—	212	—	761	1	38
39. Anthrax ...	—	—	—	—	—	—	—	—	28	2	—	—	65	—	—	—	9	1	103	3	39
40. Hydrophobia, Human ...	—	—	5	5	1	1	2	2	—	—	2	2	10	10	1	1	—	—	21	21	40
41. Leprosy ...	—	—	13	—	92	—	4	—	6	—	43	—	5	—	3	—	6	—	172	—	41
42. Madura Disease ...	—	—	177	—	—	—	3	—	12	1	241	—	10	—	19	—	—	—	462	1	42
43. Tetanus ...	17	9	70	28	4	1	24	10	5	3	13	3	31	10	18	4	64	3	246	71	43
44. Heat Stroke Syndrome ...	—	—	—	—	—	—	—	—	14	—	1	—	1	—	—	—	—	—	16	1	44
45. Confinements ...	222	—	1,332	17	187	14	755	12	648	2	1,002	7	563	2	290	5	155	2	51,554	61	45
46. Gynaecological ...	179	—	1,285	10	326	2	276	4	1,202	5	1,441	12	1,242	8	946	11	214	1	7,111	53	46
47. Diseases of Pregnancy and Parturition ...	39	4	1,714	11	565	—	231	1	34	3	869	1	401	1	232	—	36	1	4,121	22	47
48. Puerperal Fever ...	3	—	74	1	78	—	17	2	29	—	23	2	69	—	31	—	11	—	335	5	48
49. Wounds and Injuries ...	1,453	36	6,078	83	2,222	49	4,365	43	5,539	90	3,290	56	5,177	93	1,928	41	1,610	11	31,662	502	49
50. Tropical Ulcer ...	775	9	16	—	83	—	1,202	4	63	2	31	4	299	—	—	—	714	3	3,183	22	50
51. Diabetes ...	4	1	162	12	30	2	8	1	92	—	346	20	36	2	253	3	7	—	938	41	51
52. Pellagra ...	—	—	4	—	—	—	—	—	1	—	—	—	—	—	—	—	12	—	17	—	52
53. Scurvy ...	2	—	4	—	—	—	5	1	33	—	9	—	21	—	3	—	44	—	121	1	53
54. Neoplasms, Malignant ...	5	1	64	4	118	10	25	3	43	7	139	32	34	4	33	2	13	1	474	64	54
55. Neoplasms, Non-malignant	14	—	63	4	95	1	69	—	108	2	303	1	73	1	17	—	51	1	793	10	55
56. Trachoma ...	—	—	7	—	135	—	18	—	—	—	10	—	20	—	52	—	21	—	263	—	56
57. All other Eye Diseases	70	1	606	—	252	—	619	—	765	—	1,493	—	638	—	440	—	353	—	5,236	1	57
58. Ear Diseases...	18	2	50	1	62	—	80	—	14	—	20	—	83	—	106	1	9	—	442	4	58
59. Skin Diseases ...	70	—	242	—	79	3	183	—	101	—	160	3	208	1	402	2	87	1	1,532	10	59
60. Alimentary ...	557	39	3,556	241	393	32	1,468	71	3,021	161	4,343	146	3,096	278	1,782	28	778	30	18,994	1,026	60
61. Circulatory Diseases	28	2	1,174	101	173	18	146	14	834	35	1,217	154	612	79	605	22	127	5	4,916	430	61
62. Genito-Urinary Diseases	39	2	1,038	26	181	7	131	6	387	2	467	16	597	28	587	8	80	4	3,507	99	62
63. Organic Nervous Diseases	4	1	148	5	—	—	18	1	119	8	185	11	87	2	177	3	36	1	774	32	63
64. Functional Nervous Diseases	14	3	19	2	30	3	25	5	6	1	15	—	6	—	70	—	1	—	186	14	64
65. Fever of Uncertain Origin	126	12	1,185	82	245	7	344	16	551	21	523	10	200	16	1,238	17	243	7	4,655	188	65
66. All other Conditions	3,399	182	2,306	41	296	34	2,118	64	1,831	9	2,086	85	1,568	75	564	10	513	14	14,654	514	66
67. Poisoning ...	—	—	48	5	—	—	—	—	29	—	—	—	2	—	45	—	—	—	124	5	67
Total ...	10,599	473	32,364	1,324	11,746	320	26,102	709	21,516	618	25,941	962	25,671	1,078	14,410	316	13,191	246	181,540	6,046	
Missions ...	—	—	—	—	—	—	—	—	—	—	1,338	61	1,527	28	—	—	1,196	6	4,061	95	
Grand Total ...	10,599	473	32,364	1,324	11,746	320	26,102	709	21,516	618	27,279	1,023	27,198	1,106	14,410	316	14,387	252	185,601	6,141	







## CHAPTER XI

### METEOROLOGY

The following Table shows the mean rainfall recorded in provincial meteorological stations :—

PROVINCE	No. of Stations	Mean Rainfall mms.	Highest Recorded mms.	Lowest Recorded mms.
Bahr El Ghazal ... ..	10	936	1,260	595
Blue Nile ... ..	22	462	818	251
Darfur ... ..	13	538	832	218
Equatoria ... ..	20	1,298	1,726	907
Kassala ... ..	18	321	936	39
Khartoum ... ..	6	294	469	223
Kordofan ... ..	16	544	867	358
Northern ... ..	9	80	177	19
Upper Nile ... ..	14	802	1,242	527

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